Gravesham Local Plan – Regulation 18

Transport evidence

Part 1 – Baseline

On behalf of **Gravesham Borough Council**

Project Ref: 46898-5501 | Rev: A | Date: October 2020

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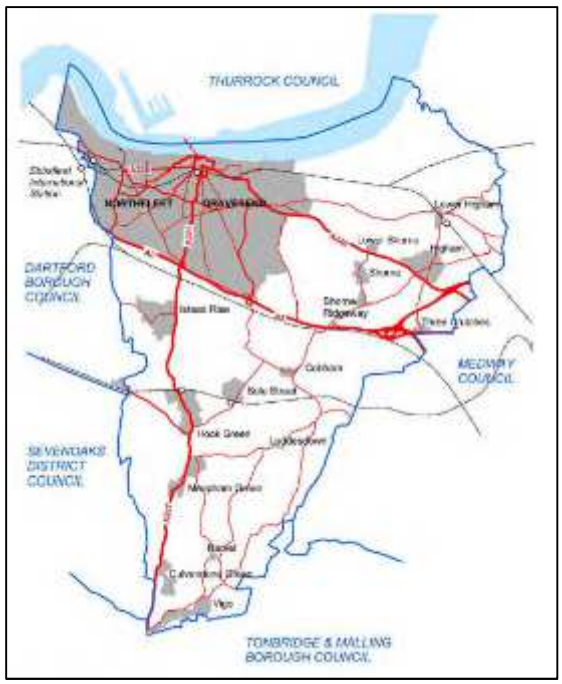
1 Introduction



1.1.1 Gravesham Borough Council (GBC) have appointed Stantec to produce a strategic level transport evidence base to support the Regulation 18 stage of the Local Plan Core Strategy review.

1.1.2 The appointment comprises 6 stages of work as listed below:

- Stage 1 – Inception and data gathering
- Stage 2 – Base year and baseline model
- Stage 3 – Baseline study
- Stage 4 – Impacts of development
- Stage 5 – Possible improvements
- Stage 6 – Findings and report

1.1.3 This document is Part 1 of 2 and considers stages 1 to 3 above. Hence this report considers the existing and baseline situation within the Borough. The Part 2 document will consider stages 4 to 6 above, and hence describes the forecasting of the options for Local Plan development.

1.1.4 This report is provided to a level of detail consistent with the needs of a Regulation 18 submission and to predominantly assist GBC in defining areas of search and potential transport issues. Further detailed transport modelling will be undertaken as options are refined to support consultation on the Regulation 19 submission version of the Local Plan prior to independent examination.

1.1.5 The evidence base developed enables GBC to compare different Local Plan options and hence facilitate their decision in identifying a preferred strategy for development in the Borough, having regard for the quality and capacity of transport infrastructure, existing and planned.

1.1.6 Hence, it is intended that this study will be used, during the Regulation 18 stage, to inform policy decisions with respect to the location and scale of new development within the Borough.

1.1.7 The study completed has sought and incorporated the views of the highway authorities of Kent County Council and Highways England who were consulted during the course of the study.

1.1.8 The study has also made reference to the Lower Thames Crossing work and A2 Bean to Ebbsfleet (A2BE) junction work currently being progressed by Highways England.

1.1.9 The National Planning Policy Framework (NPPF) was updated and adopted in February 2019. The document sets out the Government's planning policies for England and how these should be applied.

1.1.10 Section 9 of the NPPF relates to promoting sustainable transport and states that transport issues should be considered at the start of plan making and development proposals. This approach will allow the impact of development on transport networks and the opportunities to use and enhance sustainable transport networks to be considered early on.

1.1.11 Paragraph 103 states that significant development should be focused on locations which are or can be made sustainable whilst recognising that opportunities to maximise sustainable transport solutions will vary between urban and rural areas.

1.1.12 Paragraph 104 requires planning policies to support a mix of uses across an area, and within larger scale sites, to minimise the number and length of journeys needed. The need to provide high quality walking and cycling networks and infrastructure is also recognised. Hence, the NPPF requires that sites should have appropriate opportunities to promote sustainable transport modes and that these can be or have been taken up.

1.1.13 Paragraph 109 confirms that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.

1.1.14 Subsequently, paragraph 110 requires applications for development to give priority first to pedestrians and cycle movements, and second, to facilitate access to high quality public transport. Development should also address the needs of people with disabilities and reduced mobility in relation to all modes of transport and create places that are safe, secure and attractive.

1.2 This document

1.2.1 This document is structured in the following way :

- Section 2 describes the data gathered for input to the study.
- Section 3 summarises the base year traffic data available for the study.
- Section 4 summarises the forecast year baseline traffic data available for the study.
- Section 5 provides an overview of the baseline transport network within Gravesham.
- Section 6 details the baseline census data adopted for analysis within the study.
- Section 7 details the accessibility analysis completed.
- Section 8 provides a summary of the report.

2 Data gathering

2.1.1 This section summarises the collation of data input to the study.

2.2 Inception meeting

2.2.1 Following appointment an inception meeting was held between Stantec (formerly Peter Brett Associates, PBA, at that time) and GBC to meet the client, review the appointment brief and ensure that the study heads in the right direction from the outset.

2.2.2 The main points raised and discussed were :

- The Lower Thames Area Model (LTAM) is being reviewed and updated – although this will not be available for the GBC study. Hence, this study will use the currently available Shape File GIS data from Highways England.
- A schedule is available from Medway with respect to anticipated Local Plan developments and this can be compared with the LTAM uncertainty log for Medway.
- The position on London Resort Company Holdings (LRCH) is dated but gives expected visitor numbers.
- GBC to provide available traffic survey data for input to the study.
- Crash data and AQMA files to be provided to Stantec (PBA at that time).
- The assessment years are 2028 (end of current plan period) and 2036 (end of new plan period).
- A technical note on settlement hierarchy will be provided by GBC.

2.3 Study settlements

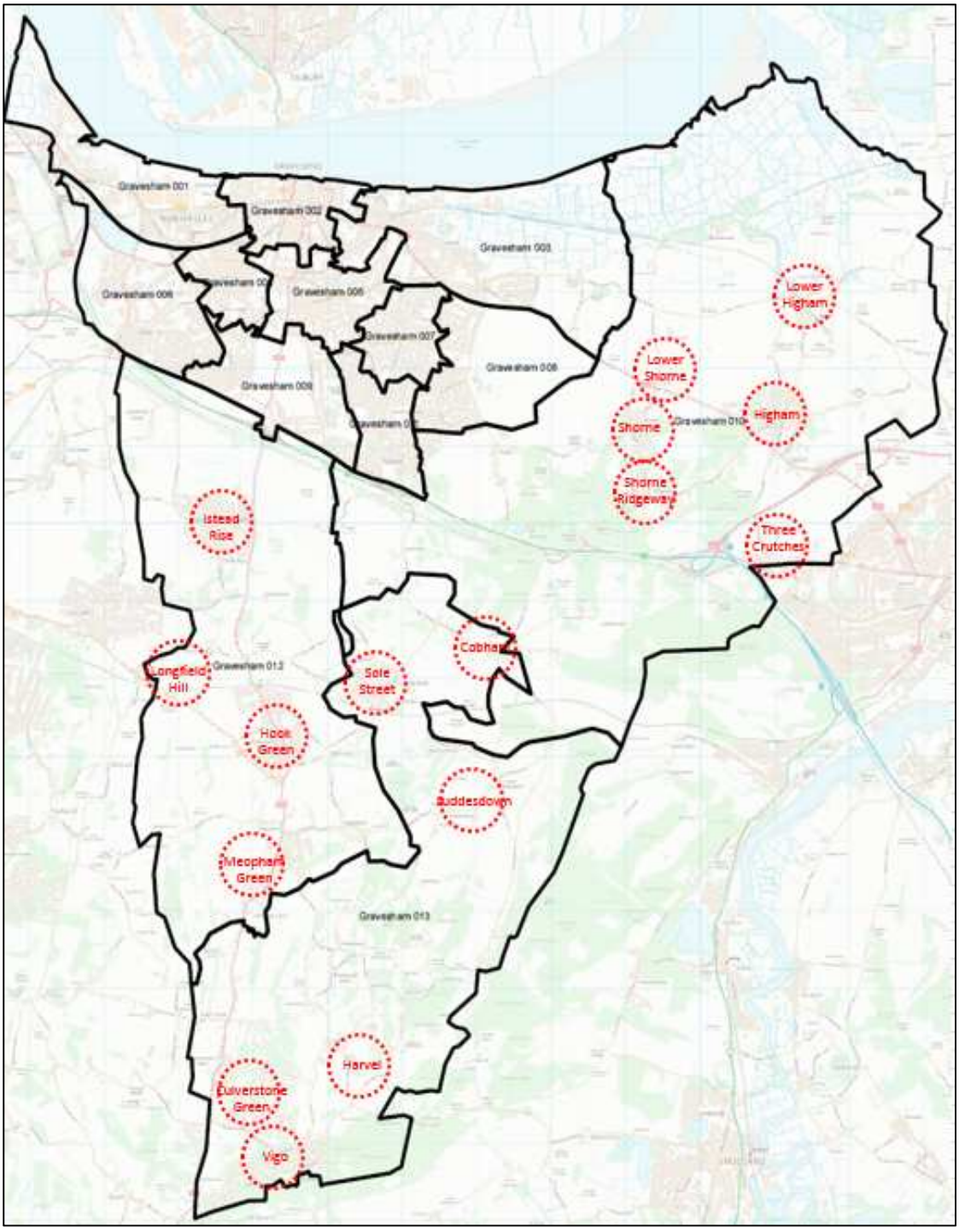
2.3.1 A number of settlements and centres have been considered within this study and these have been based upon the GBC paper “Gravesham Settlement Hierarchy Technical Paper 2017”. The locations of these settlements are shown overleaf.

2.3.2 Some of the settlements are subject to Green Belt policy and a number also fall within the Kent Downs Area of Outstanding Natural Beauty (AoNB). These distinctions have been disregarded for the purposes of this study, which deals with accessibility and potential transport issues alone. The outputs from this work may also feed into a refinement of the Gravesham Settlement Hierarchy Technical Paper in due course.

2.3.3 The key points from the 2017 paper (which should also be read in the context of the Inspector’s report on the Gravesham Local Plan Core Strategy 2014) are as summarised below:

- Recognition of insufficient land supply to meet the level of housing needed.
- A Green Belt boundary review to identify land that is unnecessary to keep permanently open.
- A review of the 2010 settlement hierarchy to identify those most sustainable in terms of accessibility to local services, community facilities and public transport.

- A review of local and national policy to inform the settlement review. In general, policy requires patterns of development to be actively managed to make the fullest use of public transport, walking and cycling and to focus significant development in locations which are or can be made sustainable. In rural areas, local planning authorities should plan housing development to reflect local needs and where it will enhance or maintain the vitality of rural communities.



2.3.4 The 2017 paper recognises that the existing urban area of Gravesend / Northfleet, which in part includes the emerging development at Ebbsfleet, are likely to be the areas capable of accommodating the most sustainable development in the borough. These areas constitute the first tier of the settlement hierarchy.

2.3.5 The 2017 paper focuses on the other settlements in the Borough, all of which lie within the rural area and have been placed into tiers 2 to 4 and "other" depending on their sustainability beneath tier 1 as follows:

- Three Second Tier settlements were identified on the basis of their larger populations of over 3,000 people, greater range of facilities and services and the availability of at least an hourly daytime bus/train service.
- Three Third Tier settlements were identified on the basis of having a lower population of between about 1,500 and 2,000 people, some services or employment land and at least an hourly daytime bus/train service.
- Three Fourth Tier settlements with populations of less than 1,000 people were identified on the basis of having a shop and a bus service running several times daily.
- In addition to the lack of services and facilities, the main characteristic of "other settlements" was the absence of a primary school.

2.3.6 The outcome of the 2017 GBC study was the following classification of settlements.

Tier 1	Tier 2	Tier 3	Tier 4	Other
Gravesend	Instead Rise	Culverstone Green	Cobham	Harvel
Northfleet	Hook Green	Meopham Green	Shorne	Lower Higham
Ebbsfleet	Higham	Vigo	Sole Street	Luddesdown
				Lower Shorne
				Shorne Ridgeway
				Three Crutches
				Longfield Hill

2.3.7 The Tier 1 settlements sit within the urban fabric of Gravesham to the north of the A2. The transport network and amenities available within this urban area are more comprehensive than for the more rural settlements to the south of the A2. On this basis the Tier 1 settlements will exhibit the greatest levels of accessibility.

2.3.8 Nevertheless, there is a need to review the potential for development in the identified Tier 2 to Tier 4 categories and the Other category and hence these have been considered in further detail within the context of this study.

2.4 Accessibility

2.4.1 The settlements above have been reviewed in terms of their high level accessibility. This review informs the decision process for determining the suitability of various settlements to accommodate Local Plan development.

2.4.2 In this study context, measures of accessibility have been taken to include the transport network serving each settlement, as well as the amenities and services at each settlement. Section 7 of this report provides the details and outcome of the accessibility exercise completed.

2.5 Baseline assumptions

2.5.1 The purpose of this study is to inform the Regulation 18 decision making process in relation to identifying areas suitable for Local Plan growth. To inform such decision making a baseline is required against which to measure different Local Plan growth scenarios. For the purpose of this study the baseline has been taken as the outputs from the LTAM model as supplied by Highways England.

2.5.2 The LTAM already makes an assumption with respect to the volume of development that will come forward during the forecast horizon period for the model (2041).

2.5.3 The LTC statutory consultation (2018) documentation contains an uncertainty log within Appendix A of the Traffic Forecasting Report. This indicates 134 development sites have been explicitly allowed for. Of these, 12 are located within Gravesham. The table below provides a summary of the development quanta allowed for, by the LTAM, for Gravesham.

Land use	Units or m^2 completed by :			
	2026	2031	2041	2051
A1-Retail	9269	9269	9269	9269
A2-Financial and Professional Services	692	692	692	692
A3-Restaurants and cafés	2059	2059	2059	2059
B1(c)-Light Industry (Business Park)	20421	20421	20421	20421
B1-Business Office	20421	20421	20421	20421
B2-Industry	34501	34501	34501	34501
B8-Storage & Distribution	13589	13589	13589	13589
C1-Hotels	15900	21400	21400	21400
C3-Dwelling House	2692	3424	3424	3424
D1-Non-residential Institutions	6253	6253	6253	6253
D2-Assembly and Leisure	40703	77703	77703	77703

2.5.4 Based upon the above, it is noted that the LTAM assumes that Gravesham Borough Council is assumed to implement the following cumulative development (from a base year of 2016) for it's core scenario testing :

- 2,692 housing units by 2026
- 3,424 housing units by 2031
- 3,424 housing units by 2041
- 3,424 housing units by 2051

2.5.5 Hence the LTAM model does not assume any housing development in Gravesham beyond 2031. This is a function of Highways England's modelling criteria (WebTag) which considers permitted and allocated development over a certain threshold.

2.5.6 The Government's standard methodology for establishing housing need gives a figure of 655 dwellings per annum (2017) but this will be subject to change as Government issues updates. It may therefore go up or down based on trends and the position Government wishes to adopt in terms of overall national delivery quantum.

2.5.7 However, based on the 655 dwellings per annum figure, Gravesham's housing requirement (making no allowance for any additional employment or other uses) from a base year of 2016 would be :

- 6,550 housing units by 2026
- 9,825 housing units by 2031
- 16,375 housing units by 2041
- 22,925 housing units by 2051

2.5.8 The LTAM assessment figure of 3,424 units is therefore 12,951 less than the 16,375 figure at 2041, using the Government's standard methodology for calculating local housing need.

2.5.9 Gravesham's adopted Local Plan Core Strategy provides the Borough's most recently adopted housing target for 2011 to 2028. In summary, the cumulative target to 2028 is shown as 6,170 units, whilst the target to 2016 is shown as 1,625 units. Hence the target for the period 2016 to 2028 can be calculated as 6,170 – 1,625 = 4,545 units.

2.5.10 The same table shows that actual completions to 2016 were 1,160 units, compared to the target of 1,625 units. Hence, the actual target for the period 2016 to 2028 can be calculated as 6,170 – 1,160 = 5,010 units.

2.5.11 Whilst a degree of future Local Plan growth is already inherent within the LTAM model at 3,424 units, based upon the above it is significantly less than the existing Local Plan figure for the same period of 5,010 units, or what Government is saying should come forward assuming the revised housing need figure is fully met locally.

2.5.12 Similar deficiencies can be identified for the levels of development tested under the LTAM for Medway, which have the potential to understate impacts on the highway network to the eastern side of the borough and on the Strategic Road Network.

2.5.13 For the sake of simplicity, the LTAM data has been used as the baseline against which to compare the various local plan scenarios to be assessed. This effectively means that different quanta and distribution of development have been subject to initial evaluation over and above what is assumed in the LTAM model

2.6 Scope of growth scenarios to be assessed

2.6.1 GBC have advised the growth options that form the study scope. This incorporates assumed growth at various settlements to deliver the housing and employment growth required by the Local Plan.

2.6.2 Unless otherwise stated, this currently assumes that growth is met in full locally with no unmet need being met by other local planning authorities within the same Housing Market Area or elsewhere.

2.6.3 As such, it provides an initial assessment of worst case scenarios before further interventions in terms of highway improvements (other than Lower Thames Crossing should it be built and the A2 Bean and Ebbsfleet junctions as set out below) or public transport improvements resulting in a modal shift away from the private car.

2.7 Highway upgrades

2.7.1 With respect to the transport schemes allowed for within the LTAM these have been categorised as either Highways England schemes or Local Authority schemes. The tables below summarise the allowances made within the model.

Highways England transport schemes allowed for in LTAM

No.	Scheme name	Scheme type	Opening date	Probability	Status
1	M20 Junction 10a	New junction	2020	More Than Likely	PCF Stage 3 - Preliminary design
2	Improvements to the A2/Bean and A2/Ebbsfleet junctions	Junction Improvement	2023	More Than Likely	PCF Stage 2 - Option Selection
3	A21 Tonbridge to Pembury	Carriageway widening	2017	Near certain	PCF Stage 6 - Construction, commissioning and handover
4	M20 Junctions 3 - 5 SMP	Smart Motorways	2018	More Than Likely	PCF Stage 3 - Preliminary design
5	M23 Junctions 8 - 10 SMP	Smart Motorways	2020	More Than Likely	PCF Stage 3 - Preliminary design
6	M3 Junctions 2 - 4a SMP	Smart Motorways	2017	Near certain	PCF Stage 6 - Construction, commissioning and handover
7	M4 Junctions 3 -12 SMP	Smart Motorways	2022	Near Certain	PCF Stage 4 - Statutory procedures and powers
8	M25 junction 30/A13 corridor relieving congestion*	Junction improvement	2017	Near certain	PCF Stage 6 - Construction, commissioning and handover.
9	M25 Junction 2 improvements	Junction Improvement	2018	Near certain	PCF Stage 3 - Preliminary design
10	A13 North Stifford Essex	Junction Improvement	2020	Near Certain	PCF Stage 3 - Preliminary design
10	M25 Junction 25 Improvements	Junction Improvement	2022	More Than Likely	PCF Stage 3 - Preliminary design
11	M25 Junction 28 Improvement	Junction improvement	2022	More Than Likely	PCF Stage 3 - Preliminary design
12	M25 Junction 10 / A3 Wisley Interchange Improvement	Junction improvement	2022/2023	More Than Likely	PCF Stage 2 - Option Selection
13	M25 Junctions 10 -16 SMP	Smart motorway	2023	More Than Likely	PCF Stage 1Technical Appraisal_Option Identification
14	M2 Junction 5 Improvement	Junction improvement	2022	More Than Likely	PCF Stage 2 - Option Selection

15	A20 Access to Dover	Junction Improvement	2017	Near certain	Completed Dec 2016

Local Authority transport schemes allowed for in LTAM

No.	Scheme name	Scheme type	Opening date	Probability	Status
1	A13 Stanford-le- Hope bypass widening	Carriageway widening	N/A	More than likely	Funding approved, contract to be awarded soon.
2	St. Clements way, Greenhithe improvement scheme	Carriageway and junction widening	2019	More than likely	Funding approved.
3	A127 / A132 Nevendon Interchange improvement scheme	Junction improvement	2016	Near Certain	Under construction, planned to open in Winter 2016.
4	Rathmore road link, Gravesend	Carriageway and junction widening	N/A	Near Certain	Construction started in May 2016.
5	A28 Chart Road improvement scheme	Carriageway widening and junction improvement	2019	More than likely	Permitted development.
6	Maidstone Bridges Improvement Scheme	Carriageway widening and junction improvement	Dec-16	Near Certain	Opened in December 2016
7	M20 Junction 4 Eastern Overbridge Widening	Carriageway widening	Feb-17	Near Certain	Opened in February 2017.
8	A289 Four Elms Roundabout to Medway Tunnel (Medway)	New Link	N/A	More than likely	Construction to start late 2017.
9	M11 J7A	Create a new junction on the M11 north of the Junction 7	2021	Near Certain	Planning permission has been approved and preparation works to start in winter 2017.
10	Silvertown tunnel	New twin bore tunnel east of Blackwall tunnel	2022/2023	More than likely	Planning application submitted/awaiting approval
11	Olympic Park Improvements	Access improvements	2021	Near certain	Open

2.7.2 The tables above identify the following highway upgrades within Gravesham.

- Lower Thames Crossing
- A2 Ebbsfleet and Bean junction upgrades
- Rathmore Road link.

2.8 Traffic flow data

2.8.1 Traffic flow data has been gathered from various sources. This data has been used to compare against the 2016 base year LTAM model for the Gravesham area to review the goodness of fit of the model to observed data. Section 3 of this report considers this in detail.

2.8.2 Traffic flow data has been considered for both the Strategic Road Network and Local Road Network. For the purposes of this study the Strategic Road Network comprises the A2 and M2 corridor.

2.9 Assessment years

2.9.1 The following assessment years have been agreed for this study :

- 2016 base year – as used by the LTAM model.
- 2019 base year – derived from interpolation of the 2016 and 2026 LTAM model.
- 2028 forecast year to reflect the end of the existing Local Plan – derived from interpolation of the 2026 and 2041 LTAM models.
- 2036 forecast year to reflect the end of the emerging Local Plan – derived from interpolation of the 2026 and 2041 LTAM models.

2.10 LTAM output

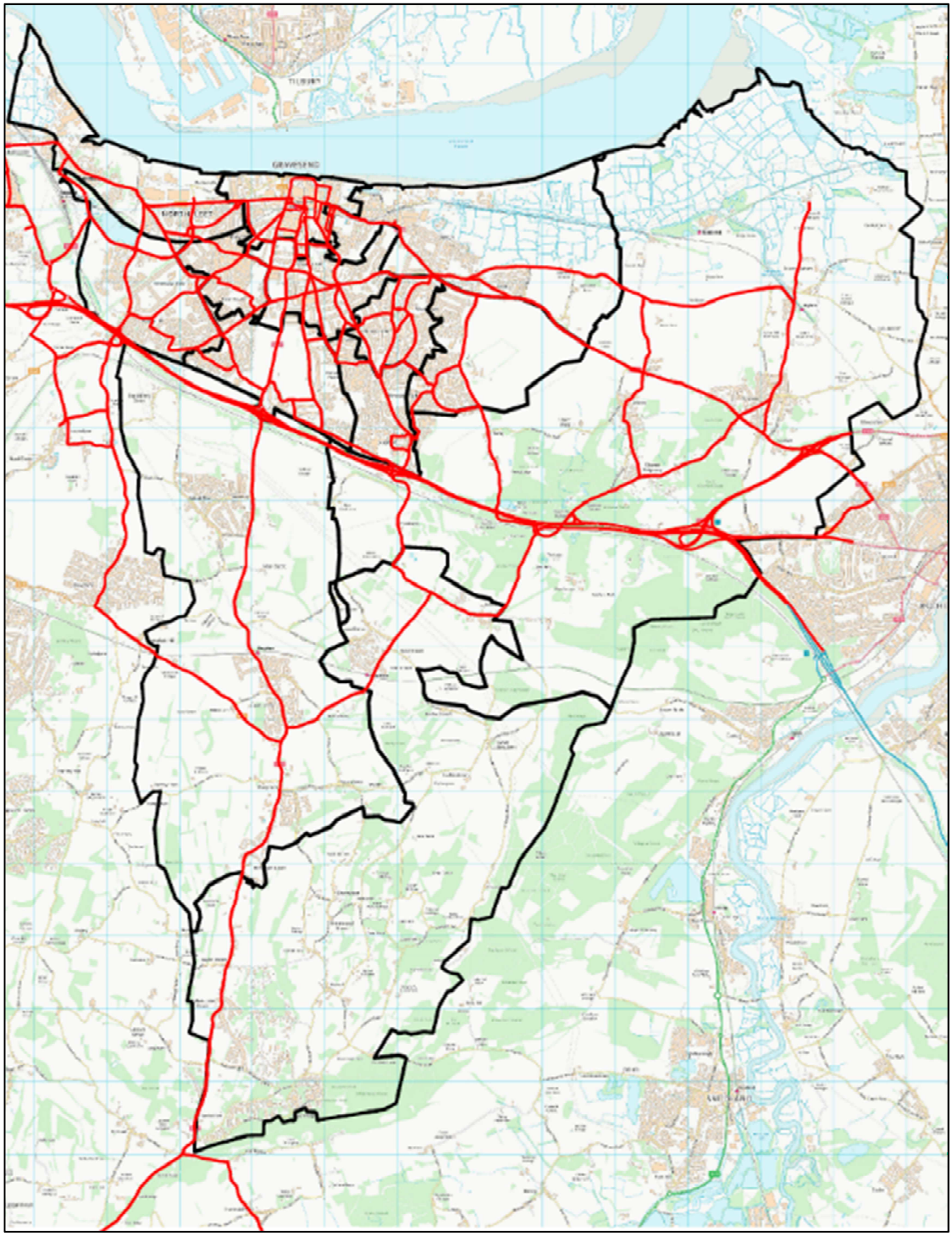
2.10.1 GBC have been provided with the LTAM output (as GIS Shape files) for their administrative boundary. This output has been adopted as the baseline flow data (as provided) within this study with Highways England's approval.

3 Base year traffic

3.1.1 This section details the reviewing and deriving of the base year traffic flows. A spreadsheet model has been developed to complete this assessment.

3.2 Modelled network

3.2.1 The figure below illustrates the LTAM model links (highlighted in red) included within the Gravesham borough boundary. This demonstrates the granularity of the model (in terms of highway links). It is noted that all key A and B routes are included and a significant proportion of other routes, particularly to the north of the A2.

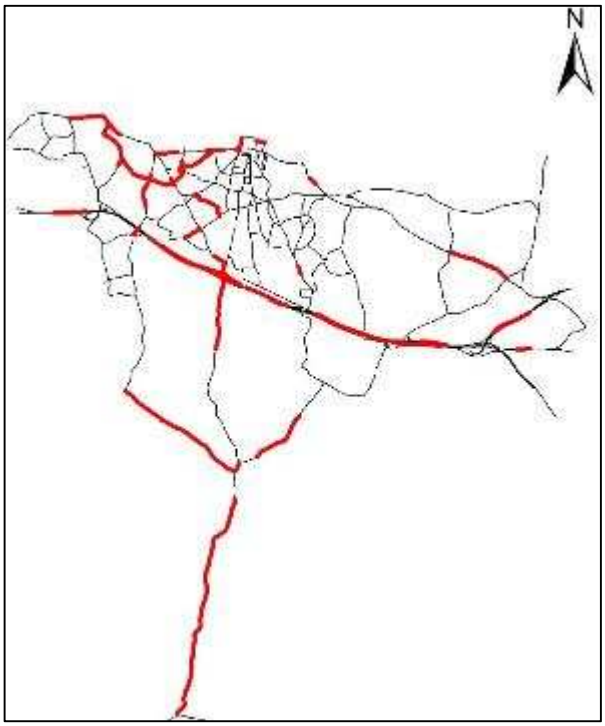


3.2.2 GBC have requested access to the revised version of the LTAM model which may include additional links and updated development quantums and scenarios as part of the uncertainty log. Whilst this report is based upon the Statutory Consultation LTAM, future work will be based upon the updated Supplementary Consultation (submission) LTAM.

3.3 Observed traffic flows

3.3.1 Empirical traffic flow data has been obtained (or derived) for 2016. The sources of the empirical data comprise the following :

- KCC data provided for the study
- A2BE technical reports
- DfT statistics
- WebTRIS for the A2 route



3.3.2 The links that are shown highlighted red in the figure opposite represent those links for which 2016 empirical data has been obtained.

3.3.3 Hence, the figure opposite illustrates the number of links where observed data has been obtained or derived for 2016, from the sources listed above, against which to compare the 2016 LTAM model data.

3.3.4 Where available, 0700-0800 and 0800-0900 morning peak hour observed data has been extracted for 2016. This has been done on the basis that the LTAM model assumes a morning peak hour of 0700-0800 (the Strategic Road Network peak) whilst this study also considers a morning peak hour of 0800-0900 (the local road network peak). This is considered further in the paragraphs below.

3.3.5 Where data for only one of these hours is available it has been factored to represent the adjacent hour and this is described below.

3.3.6 Where 2016 empirical data is not available, but alternative year data is available (within a few years), then this has been used and factored to 2016. The factors adopted are based upon Tempro data as summarised in the tables below. The top table shows factors for the AM peak period (urban and rural roads) and the bottom table the PM peak period (urban and rural roads).

3.3.7 Using the tables below it is possible to factor traffic data from the year range 2011 to 2018 to a common base year of 2016.

	AM peak - Urban				AM peak - Rural			
	Urban - Motorway	Urban - Trunk	Urban - Principal	Urban Minor	Rural - Motorway	Rural - Trunk	Rural - Principal	Rural - Minor
2011	--	1.093	1.090	1.084	1.108	1.115	1.095	1.094

2012	---	1.074	1.072	1.067	1.085	1.092	1.075	1.075
2013	---	1.055	1.054	1.051	1.063	1.068	1.056	1.056
2014	---	1.037	1.036	1.035	1.042	1.046	1.038	1.038
2015	---	1.020	1.019	1.019	1.021	1.025	1.020	1.020
2016	---	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2017	---	0.984	0.984	0.984	0.982	0.979	0.984	0.984
2018	---	0.968	0.969	0.969	0.965	0.959	0.968	0.968

	PM peak - Urban				PM peak - Rural			
	Urban - Motorway	Urban - Trunk	Urban - Principal	Urban Minor	Rural - Motorway	Rural - Trunk	Rural - Principal	Rural - Minor
2011	--	1.092	1.089	1.082	1.107	1.114	1.093	1.093
2012	---	1.073	1.071	1.066	1.084	1.090	1.074	1.074
2013	---	1.055	1.053	1.050	1.062	1.068	1.055	1.055
2014	---	1.037	1.036	1.034	1.041	1.046	1.037	1.037
2015	---	1.019	1.019	1.019	1.021	1.024	1.019	1.020
2016	---	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2017	---	0.984	0.984	0.984	0.982	0.979	0.984	0.984
2018	---	0.968	0.969	0.969	0.965	0.960	0.969	0.968

3.4 2016 base year LTAM data

3.4.1 The LTAM is a highway only Origin-Destination model. It comprises a network and a stacked matrix for the following base year scenarios:

- 2016 AM (0700-0800)
- 2016 IP
- 2016 PM (1700-1800)

3.4.2 Highways England have provided GBC with the LTAM output GIS shape files for 2016, 2026 and 2041 for the Gravesham area. This data allows plotting of base year and forecast year LTAM data on the highway network, using GIS software.

3.4.3 GBC have provided this data to Stantec and it has been used for base year and baseline assessment purposes within this study. The data files have been cordoned within GIS software to reflect the Gravesham borough boundary.

3.4.4 The LTAM data provided to Stantec provides details for highway links within Gravesham with respect to the following :

- Traffic flow
- HGV flow
- % HGVs
- Ratio of Volume to Capacity (V/C)

3.4.5 Appendices A1 to A4 contain the 2016 base year LTAM data in GIS figure format for reference for the LTAM peak hours of 0700-0800 and 1700-1800. The calculated 0800-0900 data is also included based upon the factors described at section 3.5. The data comprises total flow, total HGVs, percentage HGVs and the ratio of Volume to Capacity (as a percentage).

3.4.6 The 2016 base year LTAM traffic data has also been extracted from the Shape files and imported to a spreadsheet for analysis and this is included at Appendices K1 to K17 for key corridors within Gravesham as illustrated within Appendix K18. The 0800-0900 data has been calculated from the 0700-0800 LTAM data by factoring as described in section 3.5.

3.4.7 The above data has been reviewed with respect to the link V/C values to determine the 2016 base year performance of the highway network links within Gravesham as predicted by the LTAM. Further detailed transport modelling, including junction capacity, will be undertaken as options are refined to support consultation on the Regulation 19 submission version of the Local Plan prior to independent examination

3.4.8 Links with a V/C ratio of 85% or greater have been identified. In modelling analysis, a V/C value of up to 85% is typically considered as acceptable in terms of highway operation, providing a degree of residual capacity for daily variation. A value greater than 100% implies that the highway link is operating over capacity.

3.4.9 During the morning peak hour (0700-0800) the LTAM model indicates the following within Gravesham :

- The A2 is operating near to capacity (between 85% and 100%) in the westbound direction from the A227 (Singlewell) to beyond Ebbsfleet junction (ie beyond Gravesham).
- The only local road that is shown to be approaching capacity (between 85% and 100%) is the B261 Old Road West eastbound between Darnley Road and Wrotham Road.
- All other links within Gravesham are predicted by the LTAM model to be operating at less than 85% capacity although, due to the local road network peak being later than 0700-0800, this does not reflect the impact of school trips and commuting on the local road network. In addition, this does not reflect occasions when incidents on the strategic road network may cause traffic to divert onto the local road network.

3.4.10 During the morning peak hour (0800-0900) the calculated data indicates the following within Gravesham :

- The A227 is operating near to capacity (between 85% and 100%) in the southbound direction on the approach to Chalky Bank (north of the A2 and adjacent to the golf course).
- The B2175 London Road is operating near to capacity (between 85% and 100%) in the eastbound direction to the east of Springhead Road.
- The B261 Old Road West is shown to exceed capacity (greater than 100%) in both directions between Darnley Road and Wrotham Road and operating near to capacity (between 85% and 100%) in the westbound direction between Devonshire Road and Wrotham Road.
- Hall Road is operating near to capacity (between 85% and 100%) in the eastbound direction between Springhead Road and Painters Ash Lane.
- All other links within Gravesham are predicted by the LTAM model to be operating at less than 85% capacity, although this does not reflect occasions when incidents on the strategic road network may cause traffic to divert onto the local road network.

3.4.11 During the evening peak hour (1700-1800) the calculated data indicates the following within Gravesham :

- The A2 is operating near to capacity (between 85% and 100%) in the eastbound direction from beyond the Gravesham west boundary to the A227 junction (Singlewell). The section through Shorne Woods is also shown to be operating near to capacity (between 85% and 100%) in the eastbound direction.
- At the A2 Pepper Hill junction the A2 eastbound merge is operating near to capacity (between 85% and 100%).
- At the A2 Tollgate junction the A2 eastbound merge is operating near to capacity (between 85% and 100%).
- At the M2 junction 1 the A2 eastbound diverge is operating near to capacity (between 85% and 100%).
- The A227 Wrotham Road is operating near to capacity (between 85% and 100%) in the northbound direction on the approach to New House Lane / Cross Lane West.
- The A226 Galley Hill Road is operating near to capacity (between 85% and 100%) in the eastbound direction between High Street and Lower Road.
- The B2175 London Road is operating near to capacity (between 85% and 100%) in the eastbound direction to the east of Springhead Road.
- The B261 Old Road West is shown to be operating near to capacity (between 85% and 100%) in both directions between Darnley Road and Wrotham Road.
- The B262 Springhead Road is operating near to capacity (between 85% and 100%) in the northbound direction between Springhead Parkway and the A226.
- Hall Road is shown to exceed capacity (greater than 100%) in the eastbound direction between Springhead Road and Painters Ash Lane.
- All other links within Gravesham are predicted by the LTAM model to be operating at less than 85% capacity, although this does not reflect occasions when incidents on the strategic road network may cause traffic to divert onto the local road network.

3.4.12 On the basis of the above, the LTAM indicates that the A2 operates close to capacity during the 0700-0800 peak in the westbound direction and during the 1700-1800 peak in the eastbound direction. With respect to the local highway the LTAM model indicates that this generally operates within capacity during peak periods with localised issues on a small number of links.

3.5 Morning peak hour factors

3.5.1 The LTAM morning peak hour model flows are for a 0700-0800 time period which represents the peak hour on the Strategic Road Network. The local road network experiences a later 0800-0900 peak hour, as evidenced by the table below, and hence the LTAM 0700-0800 flows have been factored to represent an 0800-0900 peak hour.

3.5.2 The factor derived to convert between 0700-0800 and 0800-0900 has been calculated although this does not reflect occasions when incidents on the strategic road network may cause traffic to divert onto the local road network. The factors derived are based upon a number of count survey locations where count data is available for both of the morning peak hours. Separate factors have been derived for the following :

- Local roads (ie non A2)
- A2 eastbound
- A2 westbound

3.5.3 The survey data for each hour (from multiple count locations) has been added together to derive an observed “network flow” for each of these categories. The “network flow” has then been used to calculate a factor. This process has been completed on the basis of empirical data from around 50 links (both local roads and the A2). The outcome factors from this exercise is summarised below.

	Hour 0700-0800	**Hour 0800-0900**	**Factor 07-08 to 08-09**	**Factor 08-09 to 07-08**
Local roads	37,345	42,023	1.1253	0.8887
A2 eastbound	40,363	39,744	0.9847	1.0156
A2 westbound	48,629	42,151	0.8668	1.1537

3.5.4 Hence, the subsequent factors derived are as follows :

- The LTAM data for local roads have been factored by 1.1253 to convert from an 0700-0800 hour to represent 0800-0900.
- The LTAM data for the A2 have been factored by 0.9847 eastbound and 0.8668 westbound to convert from an 0700-0800 hour to represent 0800-0900. The different factors acknowledge the tidal nature of traffic flow (westbound) during the morning peak period.

3.5.5 The calculated 0800-0900 peak hour traffic flows have been adopted for assessment purposes within this study, in addition to the LTAM 0700-0800 peak hour.

3.6 2016 LTAM flows compared to observed traffic flows

3.6.1 Stantec have reviewed the model output Shape files for the key HE and KCC road networks. In particular, the predicted 2016 base year flows from the LTAM have been compared with available empirical traffic flow data for 2016. This informs the goodness of fit of the LTAM within the Gravesham administrative area.

3.6.2 Whilst this process does not represent a Local Model Validation Report (LMVR) in the usual sense, it nevertheless uses similar techniques for comparing observed traffic flows and modelled traffic data.

3.6.3 The comparison of traffic flows described below is completed in the context of the LTAM being used by GBC for a strategic development control exercise, rather than a specific scheme appraisal. The purpose of the exercise is to inform a relative comparison of the impact of Local Plan development scenarios on the transport network.

3.6.4 The modelled 2016 LTAM traffic flows have been compared to the observed 2016 data to assess the "goodness of fit" of the LTAM within the GBC area. Modelled flows are compared to the observed flows through the use of the GEH statistic as defined within the Design Manual for Roads and Bridges (DMRB). The GEH statistic for a traffic flow comparison is calculated as:

$$GEH = \sqrt{\frac{(Oberserved - Modelled)^2}{(0.5 \times (Oberserved + Modelled))}}$$

3.6.5 It is typically considered that GEH values of 5 or less would indicate an ideal acceptable fit for a link, whilst links with a GEH value greater than 10 would need further investigation, but may not necessarily be unacceptable.

3.6.6 The count database collated for the purpose of this study comprises link flows in number of vehicles and this has been compared against the modelled flows in vehicles. The number of count records included is 116 directional link counts. This reflects a good sample of the Gravesham area, both the local road network and the Strategic Road Network.

3.6.7 A comparison of the observed and modelled LTAM data, and the associated GEH statistics derived from the comparison, are summarised in the table below and included in detail at Appendix B1.

	AM 0700-0800	**AM 0800-0900**	**PM 1700-1800**
GEH < 5	47 links 40.5%	34 links 29.3%	49 links 42.2%
GEH > 5 but < 10	19 links 16.5%	26 links 22.4%	26 links 22.4%
GEH > 10	50 links 43.1%	56 links 48.3%	41 links 35.3%

3.6.8 The tables at Appendix B1 provide a tabular and visual representation of the links where count data has been checked for goodness of fit against modelled data. A green colour link denotes

GEH < 5, amber denotes a GEH between 5 and 10 whilst a red colour denotes a GEH value greater than 10. The blue links have not been subject to GEH checking.

3.6.9 On the basis of the information above it is evident that the LTAM model would not meet the usual DMRB criteria for a detailed scheme appraisal model.

3.6.10 Nevertheless, the LTAM model is currently the most appropriate tool for providing forecast year traffic flows within north Kent, particularly in the context of providing traffic flows for a Lower Thames Crossing scenario. On this basis it has been adopted for providing reference baseline traffic flows for the forecast years assessed.

3.6.11 Importantly, the objective for using the LTAM model flows in this appointment is not necessarily to achieve a model match with observed traffic flows that would be required for detailed scheme appraisal, but to be an informative when considering the relative merits of strategic Local Plan scenarios and options.

3.7 2019 base year traffic flows

3.7.1 The LTAM base year is 2016. A set of 2019 base year flows has been derived from the 2016 LTAM output through interpolation of the 2016 and 2026 data provided.

3.7.2 The same factoring has been applied to the interpolated 2019 AM (0700-0800) peak hour as described at section 3.3 to derive a 2019 AM (0800-0900) set of data.

3.7.3 Appendices C1 to C4 contains the derived 2019 base year LTAM flows in GIS figure format for reference.

3.8 Crash data

3.8.1 KCC have provided 3 years of crash data for the Gravesham borough area comprising:

- 2016 (July – December)
- 2017
- 2018
- 2019 (January – June)

3.8.2 This data has been input to GIS software and plotted by year (2016, 2017, 2018 and 2019) and by severity of crash. This data is included at Appendices D1 to D3 for reference.

3.8.3 Over the 3 year period there were 857 crashes recorded within the Gravesham borough area. The breakdown of their severity is outlined in the table below.

Year	Slight	Serious	Fatal	Total
2016 (Jul - Dec)	165	36	1	202
2017	232	33	3	268
2018	235	30	1	266
2019 (Jan - Jun)	102	17	2	121
Total	**734**	**116**	**7**	**857**
Total %	**85.6%**	**13.5%**	**0.8%**	**100%**

Crashes on the A2 corridor

3.8.4 The A2 is a key strategic link within the Gravesham borough area. During the 3 year period a total of 149 crashes were recorded on this corridor within the Gravesham borough. In general terms the crashes appear to be spread randomly along the mainline. However, there are 2 areas worthy of note where clustering of crashes is more evident as described below.

- Eastbound approach to the A2 / A227 junction where there were 9 crashes recorded, although there was not an apparent common causal factor.

Figure CD16: All Crash Data
All Accidents
Data Cluster - A2/A227 junction approach

- At the M2 Junction 1, the westbound slip road between the A289 and the A2 where there were 12 crashes recorded. An apparent common causal factor was vehicles losing control whilst travelling too fast along the bend in the road.

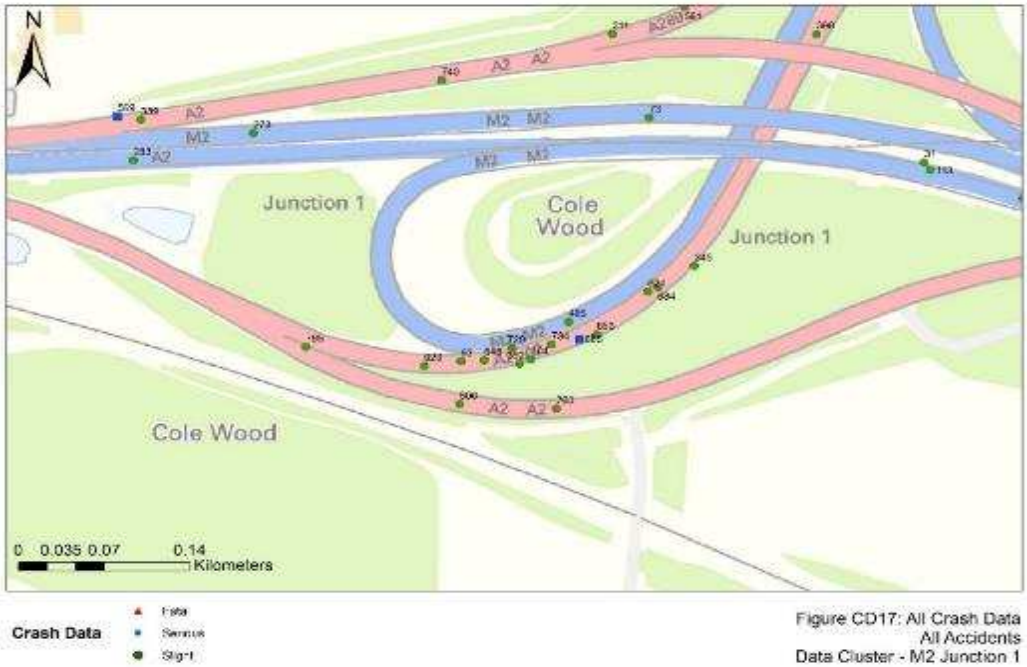


Figure CD17: All Crash Data
All Accidents
Data Cluster - M2 Junction 1

Crashes on the local roads

3.8.5 When reviewing the local roads within the wider Gravesham borough there are several areas of clustering worthy of note and these are summarised below.

Location	No. of collisions	Location on map
A226 (London Road / Thames Way junction)	8	
Earl Road / Coldharbour Road / Hall Road / Old Perry Street Crossroads	8	

Valley Drive / Livingstone Road junction	9	
Valley Drive / Old Road East Junction	6	

3.8.6 In general terms there are no common causal factors to the crashes at the above clusters although the Earl Road / Coldharbour Road / Hall Road / Old Perry Street crossroads exhibits a relatively high proportion of right turn collisions.

3.8.7 Reference will be made to this data when analysing the additional vehicle movements attributable to Local Plan development that may pass through these locations.

4 Forecast baseline traffic

4.1.1 This section details the review and derivation of forecast baseline traffic flows. Hence, this section focuses on developing a future baseline scenario appropriate for strategic option testing. A spreadsheet model has been developed to complete this assessment.

4.2 LTAM forecast year model data

4.2.1 The LTAM model data provided by GBC and HE comprises the years 2026 and 2041, for the scenarios with and without the Lower Thames Crossing. The LTAM data for 2026 and 2041 is included for reference at Appendices E1 to E4 (2026) and Appendices F1 to F4 (2041).

4.3 GBC forecast baseline traffic flows

4.3.1 GBC requires 2028 and 2036 forecast years to be considered which correspond with the current Local Plan horizon and the emerging Local Plan horizon. This data is required by GBC for the with and without Lower Thames Crossing scenarios.

4.3.2 Forecast baseline LTAM model data for 2028 and 2036 has been derived by interpolating the 2026 and 2041 LTAM output Shape files provided by GBC and HE. This has been completed for the with and without Lower Thames Crossing scenarios.

4.3.3 This process provides 2028 and 2036 baseline data for the morning peak hour (0700-08-00) and the evening peak hour (1700-1800).

4.3.4 The interpolated data for 2028 and 2036 is included for reference at Appendices G1 to G4 (2028) and Appendices H1 to H4 (2036).

4.4 Comparison between 2019 and forecast baselines

4.4.1 The forecast baseline traffic flows have been compared to the 2019 base year traffic flows within a spreadsheet model and GIS software. This exercise allows identification of areas of the network that are predicted to increase over time regardless of the new Local Plan proposals.

4.4.2 Differences have also been reviewed for the two baseline years (2028 and 2036) for the with and without Lower Thames Crossing scenarios.

4.4.3 The differences plots (created in GIS software) between 2019 and 2028 are included for reference at Appendices I1 to I2, and for 2019 to 2036 at Appendices J1 to J2.

4.4.4 The differences between the various years has also been analysed within a spreadsheet model for the key routes and corridors within the Gravesham borough. These are summarised below.

4.4.5 The same factoring has been applied to the calculated 2028 and 2036 AM (0700-0800) peak hours as described at section 3.3 to derive the 2028 and 2036 AM (0800-0900) set of data.

4.4.6 Appendices K1 to K17 contain the tabulated data for each of the routes summarised below. Each appendix contains the differences in total flow, HGV flow, percentage HGVs and V over C statistic.

4.5 A2 / M2 corridor

4.5.1 The A2 / M2 corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ Total traffic flows increase along this corridor in both directions. ■ HGV traffic flows increase eastbound and generally reduce westbound. ■ The V/C ratio is greater than 85% for the following sections : - Westbound between M2 J1 and Shorne Woods. - Westbound between Singlewell and the A227. - Westbound between the A227 and Bean junction. **With LTC** ■ Traffic flows reduce in both directions at 2028 to the west of the Lower Thames Crossing, but increase again by 2036 in the eastbound direction. ■ To the east of the Lower Thames Crossing the traffic flows increase significantly in both directions. ■ The traffic growth is higher to the east of the Lower Thames Crossing junction and lower to the west. ■ The HGV flows reduce significantly to the west of the A2 junction and increase to the east. ■ The V/C ratio is greater than 85% for the following sections : - Westbound between the A227 and Bean junction.
1700-1800	**Without LTC** ■ Total traffic flows increase along this corridor in both directions. ■ HGV traffic flows increase in both directions. ■ The V/C ratio is greater than 85% for the following sections : - Eastbound between Bean junction and M2 J1. - Westbound at 2036 between Singlewell and Ebbsfleet junction. **With LTC** ■ The eastbound traffic flows reduce to the west of the A2 junction and increase to the east whilst the westbound traffic flows increase. ■ The traffic growth is higher to the east of the Lower Thames Crossing junction and lower to the west. ■ HGV traffic flows increase in both directions. ■ The V/C ratio is greater than 85% for the following sections : - Eastbound between Bean junction and A227. - Eastbound between M2 J1 and M2 J2.

	- Westbound at 2036 between Pepper Hill and Ebbsfleet junction.

4.6 A2 / M2 corridor junctions

4.6.1 The A2 / M2 corridor junctions have been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	▪ **Ebbsfleet junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The link north of the west roundabout (to International Way) exceeds capacity in the northbound direction in both the "without LTC" and "with LTC" scenarios. ▪ **Pepper Hill junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - At 2036 the B262 Hall Road approaches capacity between the Pepper Hill link and the eastbound merge. ▪ **A227 Tollgate junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - All links operate with a V/C ratio of less than 85% ▪ **Singlewell junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The Valley Drive arm approaches capacity in the southbound direction.

	▪ **Shorne Wood junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - All links operate with a V/C ratio of less than 85% ▪ **M2 J1** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The eastbound diverge (where this splits) approaches capacity. ▪ **M2 J2** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest with no Lower Thames Crossing but significantly increase with implementation of the Lower Thames Crossing. - The effect of the Lower Thames Crossing is to increase turning movements significantly between the M2 and A228. - The eastbound and westbound diverges both exceed capacity. The link between the south roundabout and the A228 approaches capacity.
1700-1800	▪ **Ebbsfleet junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The A2 westbound exit approaches capacity at 2036. ▪ **Pepper Hill junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - At 2036 the B262 Hall Road approaches capacity.

	▪ **A227 Tollgate junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The A2 eastbound merge approaches capacity without the Lower Thames Crossing implemented. ▪ **Singlewell junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The Valley Drive arm approaches capacity in the northbound direction. The Henhurst Road arm approaches capacity in the northbound direction when the Lower Thames Crossing is implemented. ▪ **Shorne Wood junction** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - All links operate with a V/C ratio of less than 85% ▪ **M2 J1** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest compared to 2019 in both the with and without LTC scenarios. - The effect of the Lower Thames Crossing is significant (compared to "without LTC") to a number of localised turning movements. - The eastbound diverge (where this splits) exceeds capacity. ▪ **M2 J2** - Experiences a significant increase in traffic flow compared to 2019 in both the with and without LTC scenarios. - Changes in HGV movements are modest with no Lower Thames Crossing but significantly increase with implementation of the Lower Thames Crossing. - The effect of the Lower Thames Crossing is to increase turning movements significantly between the M2 and A228.

	- The eastbound and westbound diverges both exceed capacity. The link between the south roundabout and the A228 approaches capacity.

4.7 A227 corridor route

4.7.1 The A227 corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ Total traffic flows increase along this corridor in the northbound directions and for the majority of the southbound direction. The percentage increase and absolute increase is significant in places, particularly the following sections: - Northbound between the A2 and Essex Road. - Southbound between Chalky Bank and Vigo ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - Between the golf course and Chalky Bank in both directions. - Northbound in the vicinity of Cross Lane at 2036 - Northbound between Kent Road and Essex Road at 2036 - Southbound on the section immediately north of the A2. **With LTC** ■ When the Lower Thames Crossing is implemented the traffic growth is higher northbound and predominantly higher southbound. ■ HGV traffic flows generally alter by a marginal amount although there is a notable increase in the southbound direction between Hook Green and Vigo. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - Between the golf course and Chalky Bank in both directions. - Northbound in the vicinity of Cross Lane at 2036 - Northbound between Kent Road and Essex Road at 2036 - Southbound on the section immediately north of the A2.
1700-1800	**Without LTC** ■ Total traffic flows increase northbound and for the majority southbound. The percentage increase and absolute increase is significant in places, particularly the following sections: - Northbound between the A2 and Old Road west. - Southbound between the A2 and Vigo

	▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - Northbound within Hook Green - Between the golf course and Chalky Bank in both directions. - Northbound in the vicinity of Cross Lane - Immediately north of the A2 in the southbound direction **With LTC** ▪ When the Lower Thames Crossing is implemented the traffic growth is predominantly higher, than for the "without LTC", in both directions. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - Northbound within Hook Green - Between the golf course and Chalky Bank in both directions. - Northbound in the vicinity of Cross Lane - Immediately north of the A2 in the southbound direction

4.8 A226 corridor route

4.8.1 The A226 corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places, particularly the following sections: - Both directions between A2260 and the B261 - Eastbound between Lennox Road to Stuart Road - Westbound between Old Road east and Thames Way - Westbound within Swanscombe ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - High Street to Lower Road in Swanscombe in eastbound direction which exceeds capacity (greater than 100%) - Bridge over the A289 westbound which approaches capacity. - Manor Road to Saddington Road in Gravesend in westbound direction which exceeds capacity (greater than 100%).

	- Windmill Street to Woodville Place which approaches capacity (between 85% and 100%) westbound - St James' Avenue to Thames Way in Gravesend which exceeds capacity (greater than 100%) in westbound direction **With LTC** ■ The traffic growth is generally lower, than for the "without LTC", although differences are modest. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - High Street to Lower Road in Swanscombe in eastbound direction which exceeds capacity (greater than 100%) - Manor Road to Saddington Road in Gravesend in westbound direction which exceeds capacity (greater than 100%). - Windmill Street to Woodville Place which approaches capacity (between 85% and 100%) westbound - St James' Avenue to Thames Way in Gravesend which exceeds capacity (greater than 100%) in westbound direction - Police Station to Springhead Road which approaches capacity at 2036.
1700-1800	**Without LTC** ■ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places, particularly the following sections: - Both directions between A2260 and the B261 - Eastbound between Lennox Road and Old Road east - Eastbound between Chalk Road and A289 - Westbound between Old Road east and Thames Way - Westbound within Swanscombe ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - High Street to Lower Road in Swanscombe in eastbound direction which exceeds capacity (greater than 100%) - Springhead Road to Vale Road which approaches capacity in the eastbound direction at 2036. - Manor Road to Saddington Road in Gravesend in westbound direction which exceeds capacity (greater than 100%) at 2036. - Windmill Street to Woodville Place which approaches capacity (between 85% and 100%) westbound - St James' Avenue to Thames Way in Gravesend which approaches capacity (between 85% and 100%) in westbound direction **With LTC**

	▪ The traffic growth is generally mixed although differences are modest. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the following sections : - High Street to Lower Road in Swanscombe in eastbound direction which exceeds capacity (greater than 100%) - Manor Road to Saddington Road in Gravesend in westbound direction which exceeds capacity (greater than 100%) at 2036. - Windmill Street to Woodville Place which approaches capacity (between 85% and 100%) westbound - St James' Avenue to Thames Way in Gravesend which approaches capacity (between 85% and 100%) in westbound direction

4.9 B2175 London Road corridor route

4.9.1 The B2175 London Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places, particularly the section between Gordon Road and Springhead Road. ▪ HGV traffic flows generally alter by a marginal amount, reducing eastbound and increasing westbound between the A226 and Springhead Road. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except in the vicinity of Dover Road and the section between St Marks Avenue and the A226 in the eastbound direction and between Gordon Road and Dover Road westbound. **With LTC** ▪ The traffic growth is generally lower when compared to that for the "without LTC". ▪ HGV traffic flows generally alter by a marginal amount, reducing eastbound and increasing westbound between the A226 and Springhead Road. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except in the vicinity of Dover Road and the section between St Marks Avenue and the A226 in the eastbound direction and between Gordon Road and Dover Road westbound.
1700-1800	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places, particularly the section between the A226 and Springhead Road.

	▪ HGV traffic flows generally alter by a marginal amount, reducing eastbound and increasing westbound between the A226 and Springhead Road. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except in the vicinity of Dover Road in the eastbound direction and between Gordon Road and Dover Road westbound. **With LTC** ▪ The traffic growth is generally lower westbound and generally higher eastbound when compared to that for the "without LTC". ▪ HGV traffic flows generally alter by a marginal amount for all scenarios, reducing eastbound and increasing westbound between the A226 and Springhead Road. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 except in the vicinity of Dover Road in the eastbound direction and between Gordon Road and Dover Road westbound.

4.10 B261 Old Road West and Old Road East corridor route

4.10.1 The B261 Old Road West and Old Road East corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places for much of its length, particularly between Echo roundabout and the A226 in the eastbound direction and between Pelham Road and the A226 in the westbound direction. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of several sections as follows : - Between Darnley Road and Wrotham Road in the eastbound direction (which exceeds capacity at greater than 100%). - Between Woodfield Avenue and Darnley Road in the westbound direction. - Between Devonshire Road and Windmill Street in the westbound direction. - Echo roundabout which approaches capacity (between 85% and 100%) in both directions. **With LTC** ▪ The traffic growth is generally higher eastbound and lower westbound when compared to that for the "without LTC". ▪ HGV traffic flows generally alter by a marginal amount for all scenarios and reduce westbound.

	▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of several sections as follows : - Between Darnley Road and Wrotham Road in the eastbound direction (which exceeds capacity at greater than 100%). - Between Woodfield Avenue and Darnley Road in the westbound direction. - Between Devonshire Road and Windmill Street in the westbound direction.
1700-1800	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places for much of its length. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of several sections as follows : - Between Darnley Road and Wrotham Road in the eastbound direction (which exceeds capacity at greater than 100%). - Between Woodfield Avenue and Darnley Road in the westbound direction which approach capacity (between 85% and 100%). **With LTC** ▪ The traffic growth is mixed between higher and lower in both directions. ▪ HGV traffic flows generally alter by a marginal amount and reduce. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of several sections as follows : - Between Darnley Road and Wrotham Road in the eastbound direction (which exceeds capacity at greater than 100%). - Between Woodfield Avenue and Darnley Road in the westbound direction which approach capacity (between 85% and 100%).

4.11 B262 Springhead Road corridor route

4.11.1 The B262 Springhead Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ Total traffic flows increase along this corridor in both directions except between the A226 and B2175. The percentage increase and absolute increase is significant in places for much of its length. ▪ HGV traffic flows generally increase. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Springhead Parkway and the A226

	in the northbound direction, and at Pepper Hill junction in the southbound direction. **With LTC** ■ The traffic growth is generally higher than that experienced for the "without LTC". ■ HGV traffic flows generally increase. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Springhead Parkway and the A226 in the northbound direction, and at Pepper Hill junction in the southbound direction.
1700-1800	**Without LTC** ■ Without Lower Thames Crossing, total traffic flows increase along this corridor in both directions except between the A226 and B2175. ■ HGV traffic flows generally increase. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Springhead Parkway and the A226 in the northbound direction which exceeds capacity (greater than 100%), and at Pepper Hill junction and south in the southbound direction. **With LTC** ■ There is a significant increase from south of the A2 and Hall Road northbound and for most of the route southbound. The percentage increase and absolute increase is significant in places for much of its length. ■ The traffic growth is higher than that for the baseline. ■ HGV traffic flows generally increase. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Springhead Parkway and the A226 in the northbound direction which exceeds capacity (greater than 100%), and at Pepper Hill junction and south in the southbound direction. ■ The section between Springhead Parkway and Hall Road exceeds capacity.

4.12 Valley Drive corridor route

4.12.1 The Valley Drive corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places for much of its length leading to and from the A2. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Mackenzie Way and the A2 in the

	southbound direction. This section approaches capacity (between 85% and 100%) in both years. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ The traffic growth is higher than that for the "without LTC". ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Mackenzie Way and the A2 in the southbound direction. This section approaches capacity (between 85% and 100%) in both years. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places for much of its length leading to and from the A2. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Marling Way and the A2 in the northbound direction. This section approaches capacity (between 85% and 100%) in both years. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ The traffic growth is higher than that for the "without LTC". ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section between Marling Way and the A2 in the northbound direction. This section approaches capacity (between 85% and 100%) in both years. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.13 Thong Lane corridor route

4.13.1 The Thong Lane corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC**

	■ In general, total traffic flows increase along this corridor in both directions. ■ The traffic growth is generally higher than that for the "without LTC", particularly between the A2 and Vigilant Way. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. The percentage increase and absolute increase is significant in places, particularly the section between the A2 and Vigilant Way once the Lower Thames crossing is implemented. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ In general, total traffic flows increase along this corridor in both directions. ■ The traffic growth is generally higher in the northbound direction and lower in the southbound direction. ■ Traffic flows increase on the section between the A2 and Vigilant Way. ■ HGV traffic flows generally alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.14 Cobham to Gravesend corridor route

4.14.1 The Cobham to Gravesend corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is generally modest. ■ HGV traffic flows generally alter by a marginal amount ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. **With LTC** ■ In general, total traffic flows increase along this corridor in both directions.

	▪ The traffic growth is generally lower than that for the "without LTC" with the exception of the Cobham to A2 section which experiences a significant increase, particularly in the southbound direction. ▪ HGV traffic flows generally alter by a marginal amount although higher increases occur between Cobham and the A2 in the southbound direction. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the crossing over the A2. This section approaches capacity at 2028 (between 85% and 100%) and exceeds capacity at 2036 (greater than 100%). ▪ However, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. The percentage and absolute increase is significant in places. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. **With LTC** ▪ The traffic growth is generally lower than that for the "without LTC", with the exception of the Cobham to A2 section which experiences a significant increase, particularly in the southbound direction. ▪ HGV traffic flows generally alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the crossing over the A2. This section approaches capacity (between 85% and 100%). ▪ However, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.15 Cobham to A226 corridor route

4.15.1 The Cobham to A226 corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is generally modest with the exception of Brewers Road as it crosses the A2 in the northbound direction. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC**

	▪ The traffic growth is generally higher northbound and lower southbound when compared to the "without LTC". In particular, Brewers Road experiences significant increase in the northbound direction as it crosses the A2. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is generally modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ▪ The traffic growth is generally higher northbound and lower southbound than that for the "without LTC". In particular, this route experiences a significant increase in the northbound direction between the A2 and the A226. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 and hence, the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.16 Cobham to Meopham corridor route

4.16.1 The Cobham to Meopham corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is generally modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. **With LTC** ▪ The traffic growth is higher in both directions than that for the "without LTC".

	▪ HGV traffic flows alter by a marginal amount, except for the southbound direction. This scenario experiences a notable increase in HGV movements. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the Green Lane section in the southbound direction at 2036. ▪ Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is generally modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the Sole Street section in the northbound direction. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ▪ The traffic growth is lower in the northbound direction and higher in the southbound direction when compared to the "without LTC". ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the Sole Street section in the northbound direction. Nevertheless, in general the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.17 Chalk to Lower Higham corridor route

4.17.1 The Chalk to Lower Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ▪ The traffic growth is marginally higher eastbound and lower westbound, in terms of absolute number of vehicles. ▪ HGV traffic flows alter by a marginal amount.

	▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is relatively modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ▪ The traffic growth is marginally higher, in terms of absolute number of vehicles when compared to that for the "without LTC". ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.18 Shorne to Lower Road corridor route

4.18.1 The Shorne to Lower Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ▪ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is modest. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ▪ The traffic growth is marginally higher in absolute number of vehicles when compared to that for the "without LTC". ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC**

	■ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is modest. ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ The northbound traffic growth is marginally higher in absolute number of vehicles and a mix of marginally lower and higher in the southbound direction when compared to that for the "without LTC". ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.19 Whitehill Lane and Parrock Road corridor route

4.19.1 The Whitehill Lane and Parrock Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is modest with the exception of Echo roundabout. ■ HGV traffic flows alter by a marginal amount. ■ At 0700-0800 the V/C ratio is less than 85% for all links at both 2028 and 2036, whilst at 0800-0900 the V/C ratio is approaching capacity (between 85% and 100%) within Echo roundabout for northbound journeys. ■ Hence the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity. **With LTC** ■ The traffic growth is typically less than that for the "without LTC". ■ HGV traffic flows alter by a marginal amount. ■ At 0700-0800 the V/C ratio is less than 85% for all links at both 2028 and 2036, whilst at 0800-0900 the V/C ratio is approaching capacity (between 85% and 100%) within Echo roundabout for northbound journeys. ■ Hence the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity.

1700-1800	**Without LTC** ■ In general, total traffic flows increase along this corridor in both directions. Whilst the percentage increase is significant in places, the absolute increase in vehicles is modest with the exception of Echo roundabout. ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ The traffic growth is typically less in the southbound direction and a mix of increase and reduction in the northbound direction when compared to that for the "without LTC". ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. Hence the analysis indicates that the LTAM model predicts the corridor is operating within capacity.

4.20 Hall Road and Pelham Road corridor route

4.20.1 The Hall Road and Pelham Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036
0700-0800 and 0800-0900	**Without LTC** ■ Total traffic flows increase along this corridor in both directions with the exception of the Old Road W to Lennox Road section. Whilst the percentage increase is >10% in places, the absolute increase in vehicles is modest. ■ Eastbound HGV traffic flows alter by a marginal amount. In the westbound direction the HGV flows reduce between Lennox Road and Vale Road and increase marginally from Vale Road to Springhead Road. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section of Hall Road between Springhead Road and Painters Ash Lane. This section is predicted to exceed capacity (>100%) in both directions at 2028 and 2036. ■ Nevertheless, the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity. **With LTC** ■ The traffic growth is less than that for the "without LTC", with the exception of the Eastbound section between Vale Road and Lennox Road. ■ Generally, the Lower Thames Crossing results in lower flows along this corridor than the equivalent without Lower Thames Crossing scenario

	with the exception of the Eastbound section between Vale Road and Lennox Road which increases marginally. ▪ Eastbound HGV traffic flows alter by a marginal amount. In the westbound direction the HGV flows reduce between Lennox Road and Vale Road and increase marginally from Vale Road to Springhead Road. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section of Hall Road between Springhead Road and Painters Ash Lane. This section is predicted to exceed capacity (>100%) in both directions at 2028 and 2036. ▪ Nevertheless, the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity.
1700-1800	**Without LTC** ▪ In the eastbound direction there is a mix of increased and reduced flows along this corridor for both 2028 and 2036. In general, the changes are modest although the section between Salisbury Road and Pelham Road experiences notable increases. In the westbound direction there is an increase in traffic flow between Darnley Road and Salisbury Road at both years and a reduction between Salisbury Road and Springhead Road. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section of Hall Road between Springhead Road and Painters Ash Lane. This section is predicted to exceed capacity (>100%) in the Eastbound direction at 2028 and 2036. ▪ Nevertheless, the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity. **With LTC** ▪ The Eastbound traffic growth is generally higher between Painters Ash Lane and Salisbury Road and lower between Salisbury Road and Darnley Road than that for the “without LTC”. In the westbound direction, the addition of the Lower Thames Crossing results in a higher flow. ▪ HGV traffic flows alter by a marginal amount. ▪ The V/C ratio is less than 85% for all links at both 2028 and 2036 with the exception of the section of Hall Road between Springhead Road and Painters Ash Lane. This section is predicted to exceed capacity (>100%) in both directions at 2028 and 2036. ▪ Nevertheless, the analysis indicates that the LTAM model predicts the corridor is generally operating within capacity.

4.21 Dene Holm Road and New House Road corridor route

4.21.1 The Dene Holm Road and New House Road corridor has been reviewed in terms of the LTAM model flows for the 0700-0800 and 1700-1800 peak hours and the calculated 0800-0900 peak hour. The following points are noted.

	Traffic growth effects between 2019 and 2028 / 2036

0700-0800 and 0800-0900	**Without LTC** ■ Total traffic flows increase along this corridor in both directions. Whilst the percentage increase is high in places, the absolute increase in vehicles is modest. ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. This indicates that the LTAM model predicts the corridor is operating within capacity. **With LTC** ■ The traffic growth is marginally less Eastbound than that for the "without LTC", and results in a reduction in traffic flow for some Westbound sections. ■ Generally, lower flows are shown along this corridor than the "without LTC". ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. This indicates that the LTAM model predicts the corridor is operating within capacity.
1700-1800	**Without LTC** ■ Total traffic flows increase along this corridor in the eastbound direction. Whilst the percentage increase is high in places, the absolute increase in vehicles is modest with the exception of New House Lane between Harden Road and the A227. In the westbound direction the increase is less, and is a reduction between Tennyson Walk and Hall Road. ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036 except for the section of New House Lane between Meadow Road and the A227 which is shown to approach capacity (between 85% and 100%). ■ This indicates that the LTAM model predicts the corridor is generally operating within capacity. **With LTC** ■ The traffic growth is generally lower than that for the "without LTC", and results in a reduction in traffic flow for some Eastbound sections. ■ Generally, lower flows are shown along this corridor than the "without LTC". ■ HGV traffic flows alter by a marginal amount. ■ The V/C ratio is less than 85% for all links at both 2028 and 2036. ■ This indicates that the LTAM model predicts the corridor is generally operating within capacity.

4.22 Key findings

4.22.1 Based upon the tables above, the key findings are :

- Traffic growth occurs on all corridors in the “without LTC” scenario (between 2019 and 2028 / 2036).
- The LTC scheme reduces total traffic (and HGVs) on the A2 corridor to the west of the scheme by 2028.
- The LTC scheme increases total traffic (and HGVs) on the A2 / M2 corridor to the east of the LTC scheme.
- Parts of the highway network are predicted to be over capacity at 2028 / 2036, most notably :
    - Westbound on the A2 / M2 corridor between M2 J1 and Bean Junction during the morning peak.
    - Westbound between Pepper Hill and Ebbsfleet Junction by 2036 during the evening peak.
    - Eastbound on the A2 / M2 corridor between Bean Junction and the M2 J2 during the evening peak.
    - The eastbound diverge at M2 J1.
    - The diverges at M2 J2.
    - Localised sections of the A class and B class highway network on the A226, A227, B2175, B261, B262.

5 Baseline transport network

5.1.1 This section of the report provides a baseline overview of the transport network serving Gravesham for all modes. It considers the borough as a whole and also the individual settlements considered within this study.

5.1.2 Gravesham's highway network includes the A2 strategic trunk road corridor that bisects the borough in an east west direction. In general terms, to the north of this corridor lies the urban area of Gravesend whilst to the south lies the rural areas. The A226 runs parallel to the A2 from Dartford to Strood through Gravesend town centre.

5.1.3 Rural areas of the borough are served by the A227, which runs from Gravesend to the north to Tonbridge in the south.

5.1.4 The key upgrades planned for the highway network comprise the A2 Bean to Ebbsfleet junction improvements and the Lower Thames Crossing.

5.1.5 Gravesham is served by a network of local buses and the high quality Fastrack service. The bus network is focussed on Gravesend with high frequency links to Dartford town centre, Bluewater and Darent Valley Hospital.

5.1.6 High Speed train services from Gravesend mean a journey time of just 24 minutes into St Pancras. The Ebbsfleet International station also provides connections to continental Europe.

5.1.7 Gravesham also benefits from domestic rail services from Gravesend, Northfleet, Sole Street, Meopham and Higham stations as follows:

- Gravesend train station serves train services on Southeastern and Govia Thameslink lines into various London stations.
- Sole Street station is served by Southeastern trains that run between Gillingham and London Victoria.
- Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria.
- Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International.

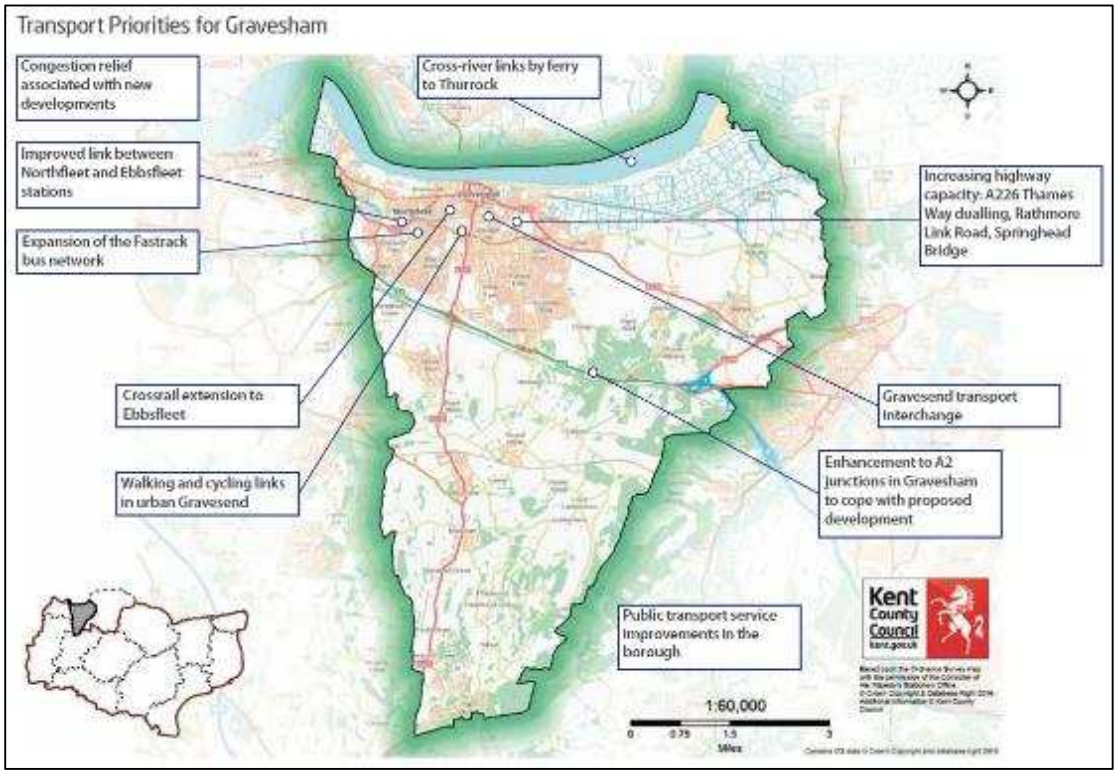
5.2 Existing issues and constraints identified by LPT4

5.2.1 Kent's Local Transport Plan 4 has been reviewed with respect to identified issues within the Gravesham borough. This is summarised below.

5.2.2 With respect to Gravesham, the priorities identified within the LTP4 comprise :

- Improved link between Northfleet and Ebbsfleet stations
- Walking and cycling links in urban Gravesend
- Gravesend transport interchange
- Enhancement to A2 junctions in Gravesham to cope with proposed development
- Expansion of the Fastrack bus network
- Congestion relief associated with new developments
- Cross-river links by ferry to Thurrock

- Increasing highway capacity: A226 Thames Way dualling, Rathmore Link Road, Springhead Bridge
- Crossrail extension to Ebbsfleet
- Public transport service improvements in the borough


Transport Priorities for Gravesham
Congestion relief associated with new developments
Cross-river links by ferry to Thurrock
Improved link between Northfleet and Ebbsfleet stations
Expansion of the Fastrack bus network
Increasing highway capacity: A226 Thames Way dualling, Rathmore Link Road, Springhead Bridge
Crossrail extension to Ebbsfleet
Gravesend transport interchange
Walking and cycling links in urban Gravesend
Enhancement to A2 junctions in Gravesham to cope with proposed development
Public transport service improvements in the baraugh
Kent County Council
1:60,000

5.3 Transport network by settlement

5.3.1 The following pages summarise the transport network serving each settlement in broad terms.

5.4 Gravesend

5.4.1 The figure and table below summarise the transport network serving Gravesend.

Topic	Notes
Population	74,000 (2016 est.)
Highway infrastructure	Gravesend town centre is served by two A roads, the A226 and the A227. The A226 is a single carriageway road with one lane in each direction and provides a link between Dartford and Strood. The A227 is a single carriageway road with one lane in each direction and provides a link between Gravesend, the A2/M2 and M20. Both these roads are subject to a 30mph speed limit through the town centre. There are a number of other radial routes into the town centre, including Parrock Street, Darnley Rd, Windmill Street and Pelham Rd. Gravesend town centre includes a one-way ring road, which forms part of the A226. From Gravesend town centre the A2/M2 is approximately 3.4km away via the A227.
Bus infrastructure	For the purpose of this review the regular buses serving Gravesend train station have been summarised in the table below.

Service No.	Description	Weekdays	Saturday	Sunday
306/308	Bluewater – Gravesend – Meopham – Vigo – Borough Green – Sevenoaks	1 service per hour (22 service per day)	1 service per hour (22 services per day)	No services

<table>
<tr><td></td><td>
<table>
<tr><td>455</td><td>Valley Drive – Gravesend</td><td>10 services per day</td><td>12 services</td><td>No services</td></tr>
<tr><td>483</td><td>Kings Farm – Gravesend – Bluewater</td><td>3 services per hour</td><td>3 services per hour</td><td>2 services per hour</td></tr>
<tr><td>416</td><td>Gravesend – Shorne - Meopham</td><td>5 services per day</td><td>3 services</td><td>No services</td></tr>
<tr><td>417</td><td>Gravesend – Shorne – Cliffe</td><td>3 services per day</td><td>3 services</td><td>No services</td></tr>
<tr><td>480/490 Sapphire</td><td>Riverview Park/Valley Drive - Gravesend - Bluewater - Dartford</td><td>6 services per hour</td><td>6 services per hour</td><td>4 services per hour</td></tr>
<tr><td>481</td><td>Riverview Park - Gravesend - Northfleet - Swanscombe - Bluewater</td><td>2 services per hour</td><td>2 services per hour</td><td>1 service per hour</td></tr>
<tr><td>B Fastrack</td><td>Temple Hill - Dartford - Bluewater - Greenhithe - Gravesend</td><td>6 services per hour</td><td>6 services per hour</td><td>3 services per hour</td></tr>
<tr><td>190</td><td>Chatham – Rochester – Strood – Chalk – Gravesend</td><td>3 services per hour</td><td>3 services per hour</td><td>1 service per hour</td></tr>
<tr><td>489</td><td>Gravesend - Southfleet - Longfield - New Ash Green</td><td>7 services per day</td><td>4 services per day</td><td>8 services per day</td></tr>
</table>

From Gravesend town centre there are regular bus services to various suburbs of Gravesend, Sevenoaks, Bluewater, Dartford, Temple Hill and Chatham.

From the train station the first bus is before 5AM and the last bus leaves after midnight.
</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Within Gravesend town centre there are generally pedestrian footways alongside the carriageways which are lit. Signal controlled pedestrian crossings are also provided including at Milton Rd, Woodville Pl, Wrotham Rd, Rathmore Rd, Darnley Rd and West St.

Within Gravesend town centre there is a pedestrianised High Street which runs between Windmill St and Crooked Ln.

Within the town centre there are no designated cycle facilities. However, on the approach to the town centre using the A226 there are cycle lanes in both directions which run between Gravesend and Strood.

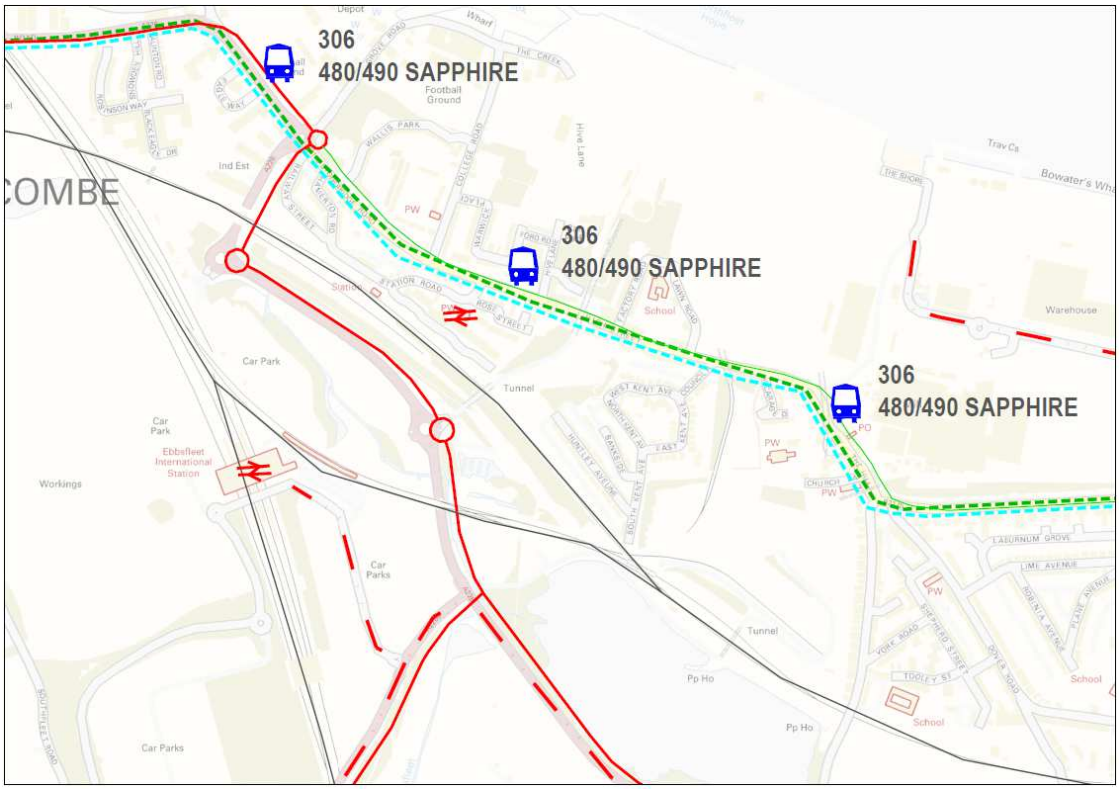
National Cycle Route 1 also passes through Gravesend to the north, which is a long-distance cycle route stretching from Dover to the Shetland Islands.</td></tr>
<tr><td>Rail infrastructure</td><td>Gravesend train station is served by Southeastern trains between Margate and London St Pancras (HS1) and Gravesend and Charing Cross. It is also served by Thameslink services between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras.

The station has 94 car parking spaces and 280 cycle spaces.</td></tr>
</table>

Key amenities and services	Gravesend has a large array of amenities, including the Thamesgate Shopping Centre, cafes and restaurants, several supermarkets, Gravesham Community Hospital, and a number of primary and secondary schools.
Closest settlements	• Northfleet • Perry Street • Singlewell • Riverview Park • Milton • Denton • Chalk

5.5 Northfleet

5.5.1 The figure and table below summarise the transport network serving Northfleet.



Topic	Notes
Population	30,000
Highway infrastructure	The main road through Northfleet is the B2175. This is a single carriageway road with one lane in each direction. The road is bordered by properties on both sides of the road and is subject to a 30mph speed limit. The B2175 (High Street) can be accessed by the A226 from the east and west. The A226 provides a link between Dartford and Strood via Gravesend. Gravesend is approximately 3.4km away, Dartford is approximately 8.7km away and Strood is approximately 16km away.

<table>
<tr><td></td><td>The A2/M2 is approximately 4km away via Springhead Road and Hall Road via the Pepperhill junction. This provides access to the wider strategic highway network.</td></tr>
<tr><td>Bus infrastructure</td><td>For the purpose of this assessment the regular buses serving Northfleet High Street have been summarised in the table below.
<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>306</td><td>Bluewater – Gravesend – Meopham – Vigo – Borough Green</td><td>5 services per day (Evening)</td><td>5 services per day (Evening)</td><td>No services</td></tr>
<tr><td>480/490 Sapphire</td><td>Riverview Park/Valley Drive - Gravesend - Bluewater - Dartford</td><td>6 services per hour</td><td>6 services per hour</td><td>4 services per hour</td></tr>
</table>
The 480/490 Sapphire is the most regular service. The first service of the day towards Valley Drive leaves Northfleet at 0555 and the last service leaves at 0042. Towards Dartford the first service of the day is at 0450 and the last service is at 2333. This service takes approximately 5 minutes to reach Gravesend town centre and 25 minutes to reach Dartford.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Along the main road through Northfleet (B2175) there are pedestrian footways on both sides of the road. These are lit with regular street lighting.

There are several pedestrian crossing facilities available through Northfleet, including dropped kerb crossing with an integrated refuge island opposite Granby Road, a zebra crossing outside Lawn Primary and Nursery School and several pelican crossings further west.

The B2175 (London Road) has designated cycle lanes on both sides of the carriageway. This cycle route links between Springhead Road and Gravesend town centre. On the B2175 (High Street) there is a shared pedestrian cycle footway on the southern side of the road.

National Cycle Route 1 also passes through Northfleet, which is a long-distance cycle route stretching from Dover to the Shetland Islands. Through Northfleet this is largely off-road.</td></tr>
<tr><td>Rail infrastructure</td><td>Northfleet station is served by Southeastern services between Gravesend and London Charing Cross via Sidcup. It is also served by Thameslink Service between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. Northfleet station has no car or cycle parking facilities.

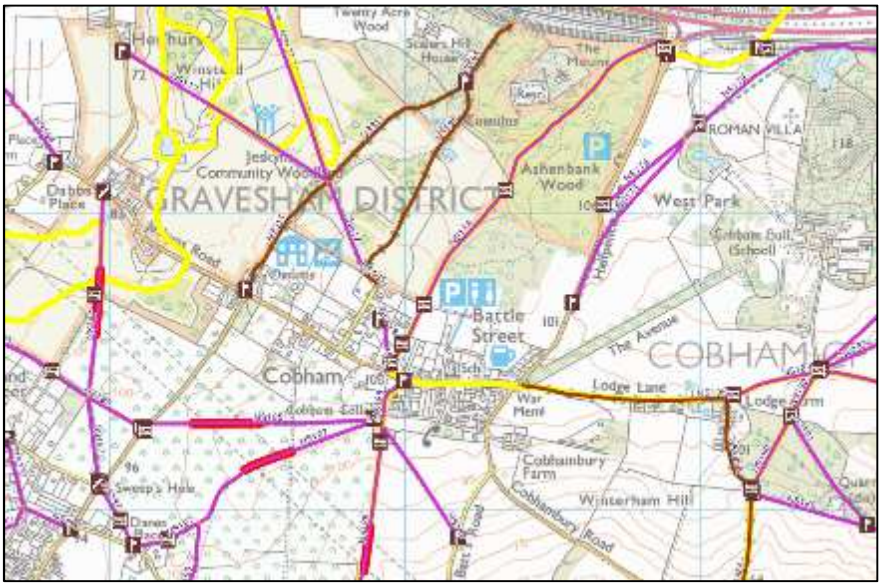
Ebbsfleet International is approximately 2.5km away. This offers high speed links from Sandwich, Margate or Faversham to London St Pancras. To London St Pancras International there is a journey time of approximately 20 minutes.</td></tr>
<tr><td>Key amenities and services</td><td>Northfleet has several local amenities, including primary schools and a secondary school, several pubs, restaurants and cafes, an Aldi supermarket, a post office, a pharmacy, several churches and a GP surgery.</td></tr>
<tr><td>Closest settlements</td><td>• Gravesend
• Swanscombe
• Springhead
• Perry Street</td></tr>
</table>

	• Ebbsfleet

5.6 Cobham

5.6.1 The figure and table below summarise the transport network serving Cobham.

Topic	Notes
Population*	870
Highway infrastructure	In the settlement of Cobham there are no A or B roads. The main road through the settlement is The Street, which is relatively narrow and fronted by properties on both sides of the road. The road has a 20mph speed limit and is subject to traffic calming measures. The A2 is approximately 1.9km north from Cobham via Halfpence Lane, which allows access to the wider transport network. Halfpence Lane is a relatively narrow single carriageway with one lane in each direction although these are demarked by a central dashed line. The horizontal and vertical alignment of the route undulates and there are several locations marked "SLOW" within the carriageway. Immediately north of Cobham the speed limit increases to 30mph. It then increases to the national speed limit as it approaches the junction with the A2.
Bus infrastructure	Cobham is served by one bus service, the 416, which stops outside St Mary Magdalene Church to the west of the settlement, and beside the War Memorial to the east of the settlement.

	This service runs between Gravesend and Meopham via Shorne and Cobham. On this service it takes 25 minutes to reach Gravesend and 10 minutes to reach Meopham. On weekdays there are five services per day and on Saturdays there are three services per day. On a weekday the first bus from Cobham towards Gravesend is at 0737 and the last bus towards Gravesend is at 1645. The last bus back from Gravesend arrives in Cobham at 1815. The bus timetable has been sourced from http://www.redroutebuses.co.uk/blank
Walking and cycling infrastructure	Cobham is connected to a variety of Public Rights of Way and Byways. This includes the Luddesdown Trek (shown in yellow), which is a circular trek starting at Shorne Woods Country Park and passes through Cobham and Luddesdown.  Within the settlement the Street and Lawrence Drive have pedestrian footways on at least one side of the carriageway. However, all other side roads do not provide pedestrian facilities. Outside Cobham Primary School there is a dropped kerb crossing point. No street lighting is present on the main road (The Street), other than outside Cobham Primary School. There are no dedicated cycling facilities. Throughout the settlement, along the main road (The Street), there are a number of traffic calming measures, including chicanes
Rail infrastructure	The nearest train station is located at Sole Street, which is approximately 2.4km to the south west of Cobham. Whilst footways are provided within the built settlements of Cobham and Sole Street these aren't continued between the settlements (ie on Sole Street). Hence, walking journeys are unlikely to Sole Street station although confident cyclists may choose to cycle along the 30mph / 40 mph routes. Sole Street station is served by Southeastern trains that run between Gillingham and London Victoria at a frequency of two per hour. It takes approximately 55 minutes to reach London Victoria and 20 minutes to reach Gillingham.

Key amenities and services*	The settlement of Cobham has several local amenities, including a Primary School, a church, 3 pubs, a recreation ground and a convenience store.
Closest settlements	• Sole Street – 2km • Hook Green – 4.1km • Gravesend – 9km
**from GBC 2017 settlement paper*	

5.7 Culverstone Green

5.7.1 The figure and table below summarise the transport network serving Culverstone Green.

Topic	Notes
Population*	1,163
Highway infrastructure	The settlement of Culverstone Green is directly connected to the A227 (Wrotham Road) which passes through the settlement. The A227 is a single carriageway road with one lane in each direction. It has a variable speed limit that is typically 30mph as it passes through settlements and 40mph outside of the settlements. Approximately 8.7km to the north of Culverstone Green the A227 connects with the A2 and approximately 5km to the south it connects with the M20 westbound. Gravesend is located approximately 12km to the north via the A227.

<table>
<tr><td></td><td>Through the settlement of Culverstone Green the A227 is subject to a 30mph speed limit and is fronted by houses on both sides of the road.

Within the settlement there are a number of residential side roads that connect with the A227. Most of these roads are narrow single carriageway lanes subject to a 30mph speed limit.</td></tr>
<tr><td>Bus infrastructure</td><td>The settlement of Culverstone Green is served by two regular bus services. These are described in the table below.

<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>769</td><td>Vigo – Meopham – Instead Rise – London</td><td>Peak hours only</td><td>No services</td><td>No services</td></tr>
<tr><td>308/306</td><td>Bluewater – Gravesend – Meopham – Vigo – Borough Green – Sevenoaks</td><td>1 service per hour (22 service per day)</td><td>1 service per hour (22 services per day)</td><td>No services</td></tr>
</table>
There are two bus stops within the settlement. One is located to the north of the settlement opposite Culverstone Green Primary School and one is located to the south opposite Newlands Lane.

From Culverstone Green it takes 20 minutes to reach Gravesend and 45 minutes to reach Sevenoaks.

The 308 / 306 is the most regular service. The first bus towards Gravesend stops in Culverstone Green at 07:19 and the last bus stops at 23:32. Towards Sevenoaks the first bus stops in Culverstone Green at 05:56 and the last bus stops at 23:53.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Within the settlement the main road (A227 Wrotham Rd) has a pedestrian footway on at least one side of the carriageway for its entirety.

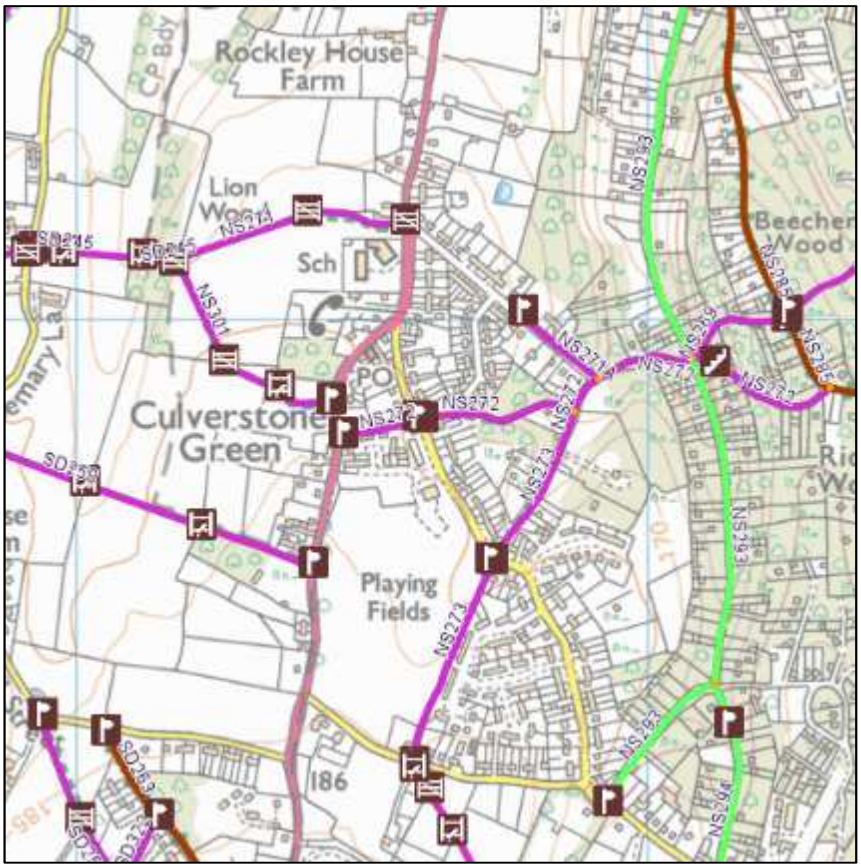
Some of the side roads have pedestrian footways on at least one side of the road although the majority are single track lanes with no pedestrian facilities.

Adjacent to Culverstone Green Primary school there is a zebra crossing integrated with a pedestrian refuge island.

The majority of the settlement is unlit, with street lighting only provided next to Culverstone Green Primary School and the Texaco petrol station.

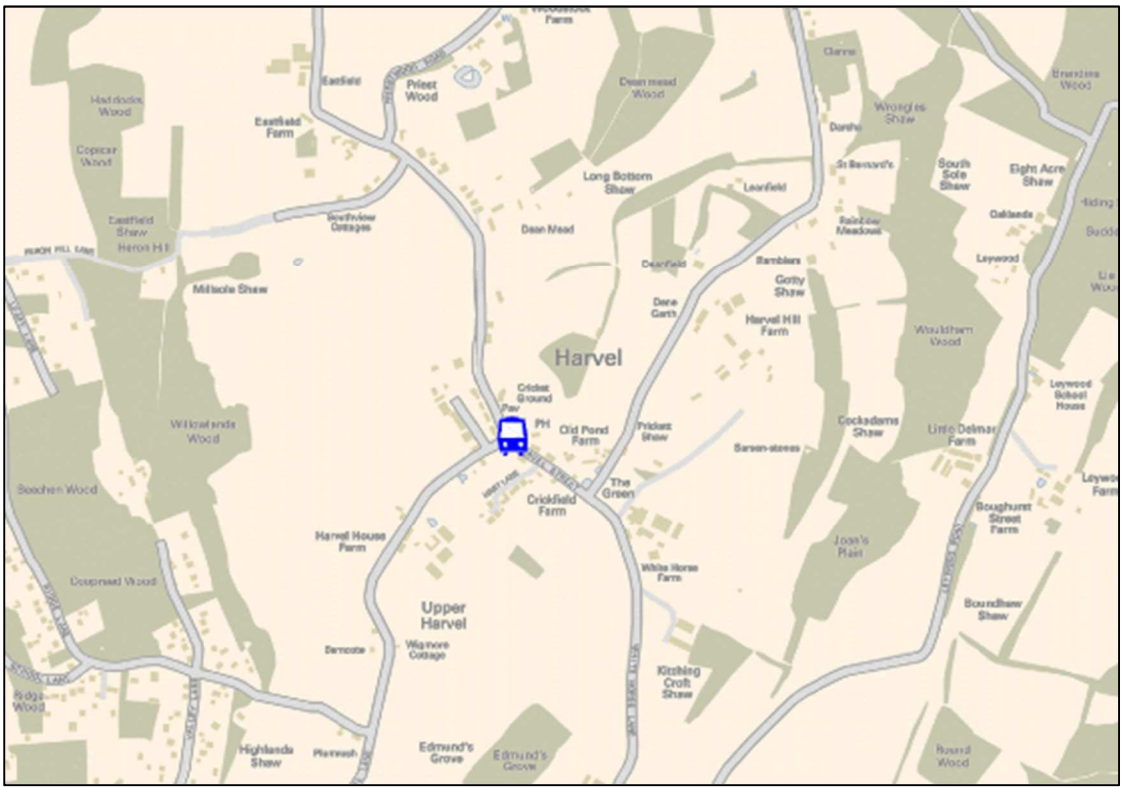
There are no dedicated cycle facilities. However, the main road through the settlement is a 30mph single carriageway road with one lane in each direction demarked by a central dashed line.

Culverstone Green is well connected to several Public Rights of Way, Byways and Bridleways</td></tr>
</table>

	
Rail infrastructure	The nearest train station is Meopham station in Hook Green, which is approximately 6km from the settlement. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours, trains into and out of London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces. Alternatively, Borough Green and Wrotham station is approximately 6.9km from Culverstone Green. Borough Green and Wrotham station is also served by Southeastern trains that run between Ashford International and London Victoria. During the peaks trains into London run at a frequency of 3 per hour. During the off-peak periods they run at a frequency of 2 per hour.
Key amenities and services*	The settlement of Culverstone Green has serval amenities, including 2 convenience stores (one of which is within a petrol filling station), a primary school, a petrol station, a pub and a cricket ground.
Closest settlements	• Meopham Green - 2.4km • Vigo Settlement - 2.6km • Gravesend - 12.1km
**from GBC 2017 settlement paper*	

5.8 Harvel

5.8.1 The figure and table below summarise the transport network serving Harvel.



Topic	Notes
Population*	Unknown
Highway infrastructure	The settlement of Harvel is not located in close proximity to any significant A or B roads and is accessed from relatively narrow rural routes. The nearest A road is the A227 (Wrotham Road), which is approximately 5.3km to the west of the settlement. The A227 is a single carriageway road with one lane in each direction. It has a speed limit of 30mph as it passes through settlements and 40mph outside of the settlements. The main access route to the settlement from the south is from the A227 via Harvel Road and White Horse Lane through the settlement of Vigo. These are narrow single carriageway rural routes that are typically subject to national speed limit. From the north, the main access route is also from the A227 at Meopham via Heron Hill Lane. This is a narrow single carriageway rural route subject to the national speed limit.
Bus infrastructure	Despite a bus stop being provided within the settlement, there are no daily regular bus services which serve the settlement of Harvel. Harvel is now only served twice weekly by the Meopham community bus.
Walking and cycling infrastructure	Within the settlement a pedestrian footway is only provided alongside the community hall.

	There are no dedicated cycle or crossing facilities. No street lighting provided. Harvel is well connected to several Public Rights of Way and Bridleways. Nearby is the Harvel Hike which spans between Harvel and the North Downs Way (shown in yellow).
Rail infrastructure	The nearest train station is Meopham station in Hook Green, which is approximately 6km from the settlement. There are no pedestrian routes to this station and cycling would need to be undertaken along narrow rural lanes. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into and out of London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces. Alternatively, Borough Green and Wrotham station is approximately 6.9km from Culverstone Green and could be used as an alternative station. Borough Green and Wrotham station is also served by Southeastern trains that run between Ashford International and London Victoria. During the peaks trains into London run at a frequency of 3 per hour. During the off-peak periods they run at a frequency of 2 per hour.
Key amenities and services*	The settlement of Culverstone Green has several amenities, including 2 convenience stores (one of which is within a petrol filling station), a primary school, a petrol station, a pub and a cricket ground.
Closest settlements	• Meopham Green - 2.4km • Vigo Settlement - 2.6km • Gravesend - 12.1km
from GBC 2017 settlement paper	

5.9 Higham

5.9.1 The figure and table below summarise the transport network serving Higham.

Topic	Notes
Population*	3,277
Highway infrastructure	The settlement of Higham is bordered by the A226 on its south western edge. The A226 is a single carriageway road with one lane in each direction as it passes through Gravesham. Through the settlement of Higham the A226 is subject to a 40mph speed limit and is bordered by houses on the north side of the carriageway and generally open to the south. Approximately 7.5km to the west of Higham, the A226 passes directly through Gravesend and continues to connect to Dartford. Approximately 1.1km to the east the A226 connects to the A289, which in turn is around 3km west of the A2 / M2, thus allowing access to the wider transport network. The main roads within the settlement are Villa Road, Forge Lane, Hermitage Rd and School Lane. These are residential roads subject to a 30mph speed limit.
Bus infrastructure	The settlement of Higham is served by 3 regular bus services. These are described in the table below.

Service No.	Description	Monday – Friday	Saturday	Sunday

	190	Chatham – Rochester – Strood – Chalk – Gravesend	3 services per hour	3 services per hour	1 service per hour
	417	Gravesend – Shorne – Cliffe	3 services per day	3 services	No services
	736	Gravesend – Higham – Northfleet – London	Peak hours only	No services	No services

The number 190 passes through Higham along the A226 to the south, whilst the 417 and 736 pass through the centre of the settlement via School Lane and Forge Lane before joining the A226.

The 190 is the most regular service. On this bus it takes approximately 15 minutes to reach Gravesend and 20 minutes to reach Chatham.

The first bus of the day towards Gravesend stops in Higham at 05:28 and the last bus stops at 18:51.

Towards Chatham the first bus of the day stops in Higham at 06:11 and the last bus stops at 19:37.

Walking and cycling infrastructure

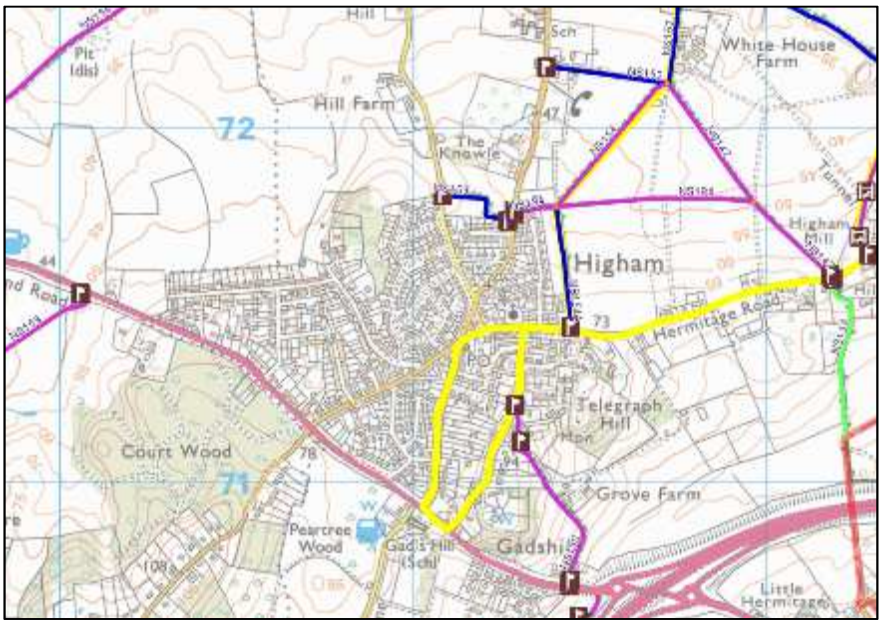
Along the A226 through the settlement there are pedestrian footways on at least one side of the carriageway. This road is lit.

Along the A226 there are numerous pedestrian crossing points with pedestrian refuge islands. At the A226 / Peartree Lane / Villa Road crossroads there is also a pelican crossing.

The A226 has cycle lanes in both directions within the settlement. These end outside the Sir John Falstaff pub to allow space for right turn bays, but re-start 200m further along the road. These connect to Gravesend to the west and Strood to the east.

The majority of the settlement's residential roads also have pedestrian footways on at least one side of the carriageway. Most of the roads are also lit with regular street lighting.

Higham is connected to a couple of Public Rights of Way. It also gives access to the Charles Dickens and Higham walk (shown in yellow).



Rail infrastructure	The closest rail station is located in Lower Higham (called Higham station), approximately 1.4km to the north of Higham. A footway is provided between Higham and Higham Station and hence pedestrian journeys are possible. Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. During the peak and off-peak hours there are 2 direct services per hour. During the morning / evening peaks Higham station is also served by 4 direct train services operated by Southeastern. These run between Strood and Charing Cross / Cannon Street. It is also possible to change at Gravesend and board HS1 services into London St Pancras International. This route option is available twice per hour throughout the day.
Key amenities and services*	The settlement of Higham has several local amenities, including a Primary School, a post office, a GP surgery, a pharmacy, 4 convenience stores, 2 churches, 2 pubs and a hairdresser.
Closest settlements	• Lower Higham - 1.6km • Shorne - 2.5 • Gravesend - 8km
from GBC 2017 settlement paper	

5.10 Hook Green

5.10.1 The figure and table below summarise the transport network serving Hook Green.

<table>
<tr><th>Topic</th><th>Notes</th></tr>
<tr><td>Population*</td><td>3,254</td></tr>
<tr><td>Highway infrastructure</td><td>The settlement of Hook Green is located along the A227 (Wrotham Road). The A227 is a single carriageway road with one lane in each direction. It has a variable speed limit that is usually 30mph through settlements and 40mph outside the settlements.

Approximately 4km to the north the A227 gives access to the A2/M2 and approximately 10km to the south it gives access to the M20, this allowing access to the wider transport network. It also connects to Gravesend approximately 7km to the north.

Through the village of Hook Green, the A227 is fronted by properties on both sides of the carriageway and subject to a 30mph speed limit with a speed camera in force.</td></tr>
<tr><td>Bus infrastructure</td><td>There are three buses which regularly serve the settlement of Hook Green. These are described in the table below.
<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>769</td><td>Vigo – Meopham – Instead Rise – London</td><td>Peak hours only</td><td>No services</td><td>No services</td></tr>
<tr><td>308 / 306</td><td>Bluewater – Gravesend – Meopham – Vigo – Borough Green – Sevenoaks</td><td>1 service per hour</td><td>1 service per hour</td><td>No services</td></tr>
</table>
There are a number of bus stops along the A227 in Hook Green. There is one to the north of the settlement opposite Station Road and one to the south of the settlement opposite the Meopham Community Academy. There are also several in between these two locations.

The 308 / 306 is the most regular bus service. On this bus it takes approximately 20 minutes to reach Gravesend and 50 minutes to reach Sevenoaks from Hook Green.

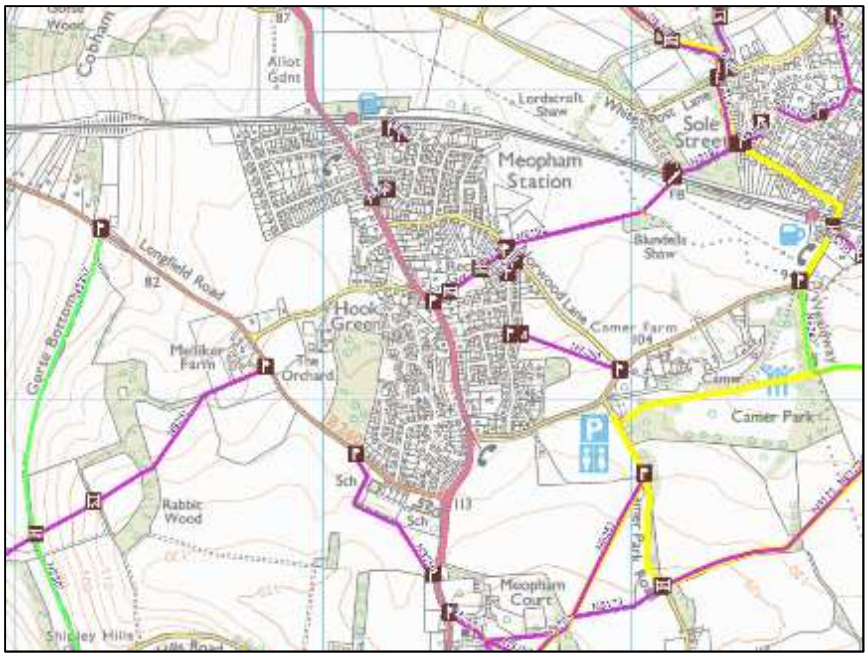
The first bus of the day towards Gravesend stops in Hook Green at 07:25 and the last bus stops at 23:38. Towards Sevenoaks the first bus stops in Hook Green at 05:49 and the last bus stops at 23:47.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Along the main road (A227) through the settlement there is a pedestrian footway on at least one side of the carriageway throughout. There is also street lighting.

Along the A227 there are several crossing facilities with pedestrian refuge islands.

On the residential roads within the settlement there are also pedestrian footways on at least one side of the carriageway. However, these roads are generally unlit.

There are no designated cycle facilities on the A227. However, the road is a 30mph single carriageway road with one lane in each direction, demarked by a centre dashed white line.

Hook Green has access to several Public Rights of Way and the Camer Park Easy Access Trail (shown in yellow)</td></tr>
</table>

	
Rail infrastructure	The nearest train station is Meopham station which is located on the north fringe of Hook Green itself. It is located approximately 600m from the centre of Hook Green. Walking routes are provided alongside the main carriageway passing through the settlement and hence walking journeys are provided for within the settlement. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into and out of London run at a frequency of 4 per hour. During the off-peak period the trains run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	The settlement of Hook Green has a wide range of accessible amenities, including a Tesco Express, several restaurants, a primary school, a pharmacy, a pub, a post office, a car garage and a recreational ground.
Closest settlements	• Meopham – 1.3km • Sole Street – 2.2km • Istead Rise – 3km • Gravesend – 7.2km
**from GBC 2017 settlement paper*	

5.11 Istead Rise

5.11.1 The figure and table below summarise the transport network serving Instead Rise.

Topic	Notes
Population*	3,413
Highway infrastructure	The settlement of Istead Rise is located on the west side of the A227 (Wrotham Road) The A227 is a single carriageway road with one lane in each direction. It has a varying speed limit that is usually 30mph when passing through settlements and 40mph outside of the settlements. Approximately 1.4km to the north of Instead Rise is the A2 and approximately 13km to the south is access to the M20 westbound. The A227 also directly connects to Gravesend approximately 4.5km to the north. Where the A227 passes Istead Rise, the road is subject to a 40mph speed limit, with very few houses fronting the road. Inside the settlement Arcadia Rd, Lewis Rd and Istead Rise comprise the main roads through the settlement. These are single carriageway roads with one lane in each direction. They are fronted by houses on both sides of the road and are used by vehicles for on street parking.
Bus infrastructure	The settlement of Istead Rise is served by two regular bus services. These are described in the table below.

Service No.	Description	Weekdays	Saturday	Sunday
769	Vigo – Meopham – Instead Rise – London	Peak hours only	No services	No services
308/306	Bluewater – Gravesend – Meopham – Vigo –	1 service per hour	1 service per hour	No services

	Borough Green – Sevenoaks			

Within Istead Rise, buses enter the centre of the settlement rather than bypassing it via the A227. The buses turn off the A227 into Istead Rise, they then travel along Lewis Road, and Arcadis Road, before re-joining the A227.

Two bus stops are located on Istead Rise, one is located on Lewis Road and one is located on Arcadis Road.

The most regular bus is the 208 / 306. This takes 20 minutes to reach Gravesend and 50 minutes to reach Sevenoaks.

Towards Gravesend the first bus of the day stops in Istead Rise at 07:36 and the last bus stops at 23:44.

Towards Sevenoaks the first bus of the day stops at 05:41 and the last bus stops at 23:42.

Walking and cycling infrastructure

Within Istead Rise all roads, including the A227 have pedestrian footways on at least one side of the carriageway. These roads are also lit with street lighting at regular intervals.

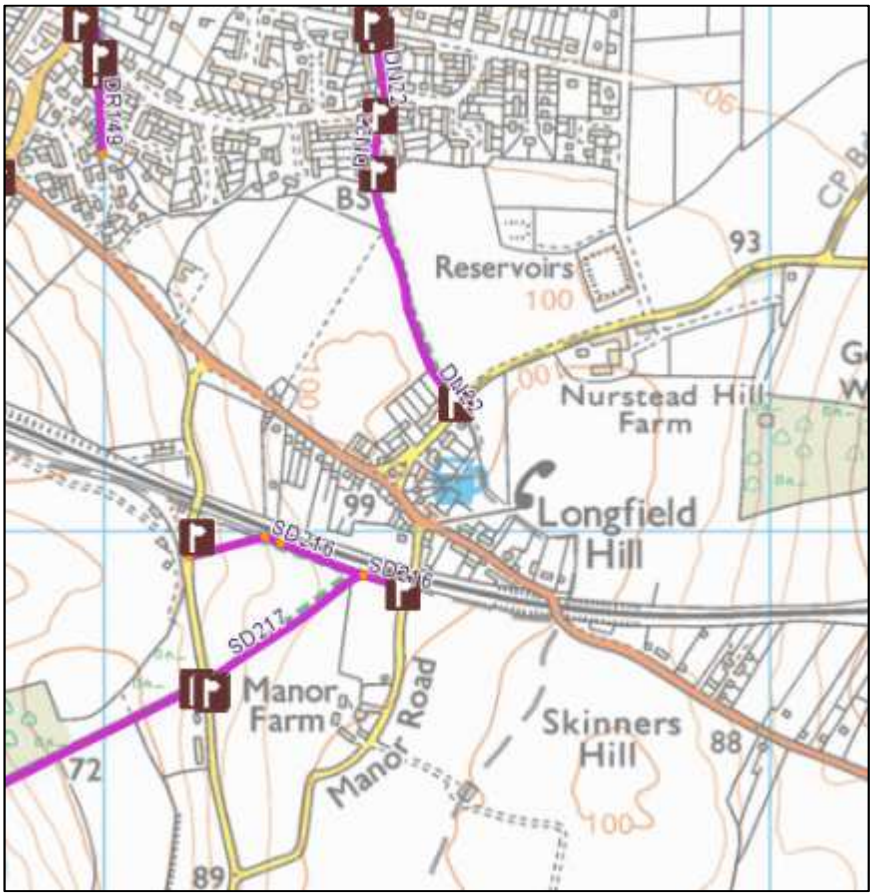
There are no designated cycle facilities, but the majority of roads are single carriageway roads with one lane in each direction, demarked by a centre dashed white line.

Istead Rise has several accessible Public Rights of Way and access to a Bridleway.

Rail infrastructure	The nearest train station is Meopham station in Hook Green, which is approximately 2.9km from the settlement. No footways connect Instead Rise with this station. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into and out of London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	Istead Rise has several local amenities, including a Co-op, a primary school, a medical centre, a pharmacy, a dentist and a hairdresser.
Closest settlements	• Hook Green – 3.1km • Gravesend – 4.7km
from GBC 2017 settlement paper	

5.12 Longfield Hill

5.12.1 The figure and table below summarise the transport network serving Longfield Hill.

Topic	Notes
Population*	Unknown
Highway infrastructure	Longfield Hill in Gravesham comprises an area of sporadic development lying to the south of a railway cutting within the Gravesham borough. It is separated from the Longfield Hill settlement within Dartford Borough to the north of the rail cutting by traffic calming and rail bridge. Longfield Hill is located on the B260 Longfield Road, which connects to the A227 Wrotham Road to the east and the A225 / A296 / A282 to the west. Through the settlement within Gravesham Longfield Road is subject to the national speed limit.
Bus infrastructure	Despite a bus stop being provided within the settlement, there are no daily regular bus services which serve the settlement. Only a school bus serving the Longfield Academy and the Meopham community bus which operates once a day on Tuesdays and Fridays.
Walking and cycling infrastructure	In the Gravesham settlement of Longfield Hill there is a pedestrian footway on the south side of the carriageway. However, this footway does not continue over the railway bridge and thus allows no pedestrian access to the Dartford Borough Council settlement. The settlement also has no street lighting. Longfield Hill is connected to 2 public rights of way. 

Rail infrastructure	The nearest train station is Meopham station in Hook Green, which is approximately 2.6km from the settlement. Whilst a narrow footway is provided alongside the B260 Longfield Road, this does not continue along Melliker Lane. Hence pedestrian access to the station is not continuous. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	Longfield Hill within the Gravesham boundary has limited local amenities that includes only a cattery. A car garage, a church and a pub can be found in the Dartford borough boundary, but there is no footway over the bridge, meaning access to these amenities by foot would be unsafe.
Closest settlements	• Hook Green – 2.6km • Istead Rise – 3.5km • Gravesend – 7.7km
from GBC 2017 settlement paper	

5.13 Lower Higham

5.13.1 The figure and table below summarise the transport network serving Lower Higham.

<table>
<tr><th>Topic</th><th>Notes</th></tr>
<tr><td>Population*</td><td>703</td></tr>
<tr><td>Highway infrastructure</td><td>There are no significant A or B class roads which directly pass through the settlement of Lower Higham which is located approximately 1.5km to the north of the settlement of Higham.

The closest major road is the A226, which is approximately 2.1km to the south west and can be accessed via Forge Lane, School Lane and Chalk Road through the village of Higham. All three of these roads are subject to a 30mph speed limit and traffic calming measures, including road humps and chicanes are implemented.

The A226 is a single carriageway road with one lane in each direction for all links throughout Gravesham.

Approximately 8km to the west the A226 passes directly through Gravesend and continues to connect to Dartford.

Approximately 2.7km to the east it connects to the A289 and the A2, which provides access to the strategic highway network.</td></tr>
<tr><td>Bus infrastructure</td><td>There are two bus services which regularly service Lower Higham. These are detailed in the table below.

<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>417</td><td>Gravesend – Shorne – Cliffe</td><td>3 services per day</td><td>3 services</td><td>No services</td></tr>
<tr><td>736</td><td>Gravesend – Higham – Northfleet – London</td><td>Peak hours only</td><td>No services</td><td>No services</td></tr>
</table>

There are two bus stops in Lower Higham. One on Chequers Street which serves the 417, and one on School Lane opposite Steadman Close which serves the 417 and 736.

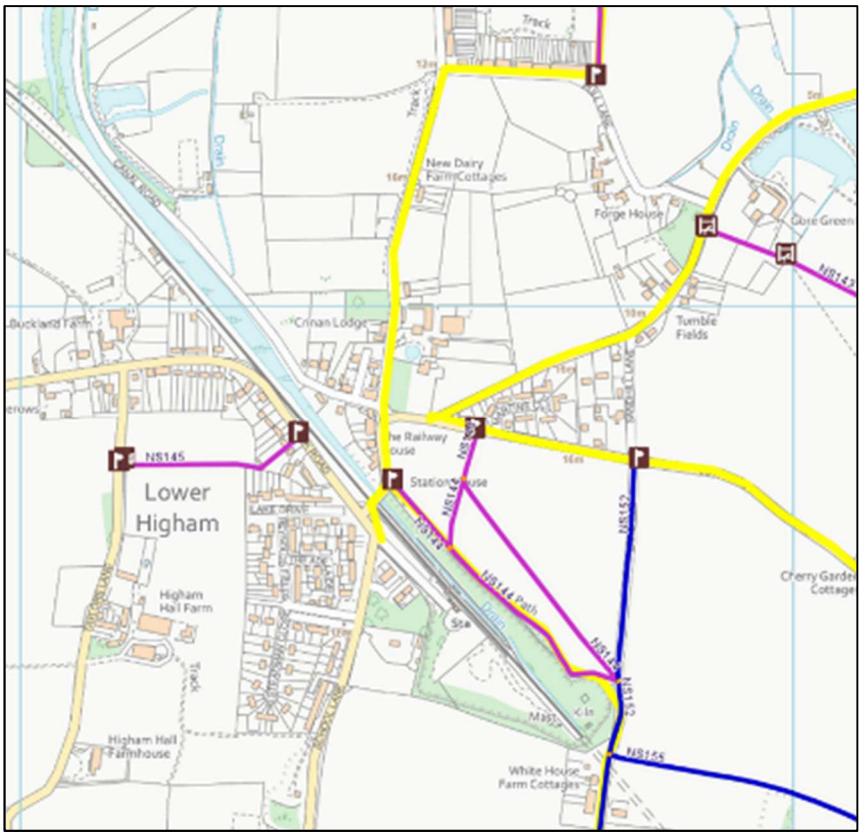
On weekdays the 417 is the main bus service. To Gravesend the bus journey takes approximately 45 minutes. The first bus of the day stops in Lower Higham at 07:35 and the last bus stops at 14:00.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Throughout the settlement pedestrian footways are provided on at least one side of the carriageway. The majority of the roads are lit with relatively regular street lighting.

There are very few pedestrian crossing points. Where present they are exclusively dropped crossings.

The settlement incorporates traffic calming measures in the form of speed humps and chicanes.

There are no designated cycle facilities, however the roads within the settlement and those connecting to Higham are single carriageways with one lane in each direction, demarked by a centre line.

Lower Higham is connected to several Public Rights of Way and a Bridleway. It also provides access to the Heron Trail and the Charles Dickens and Higham walk (shown in yellow).</td></tr>
</table>

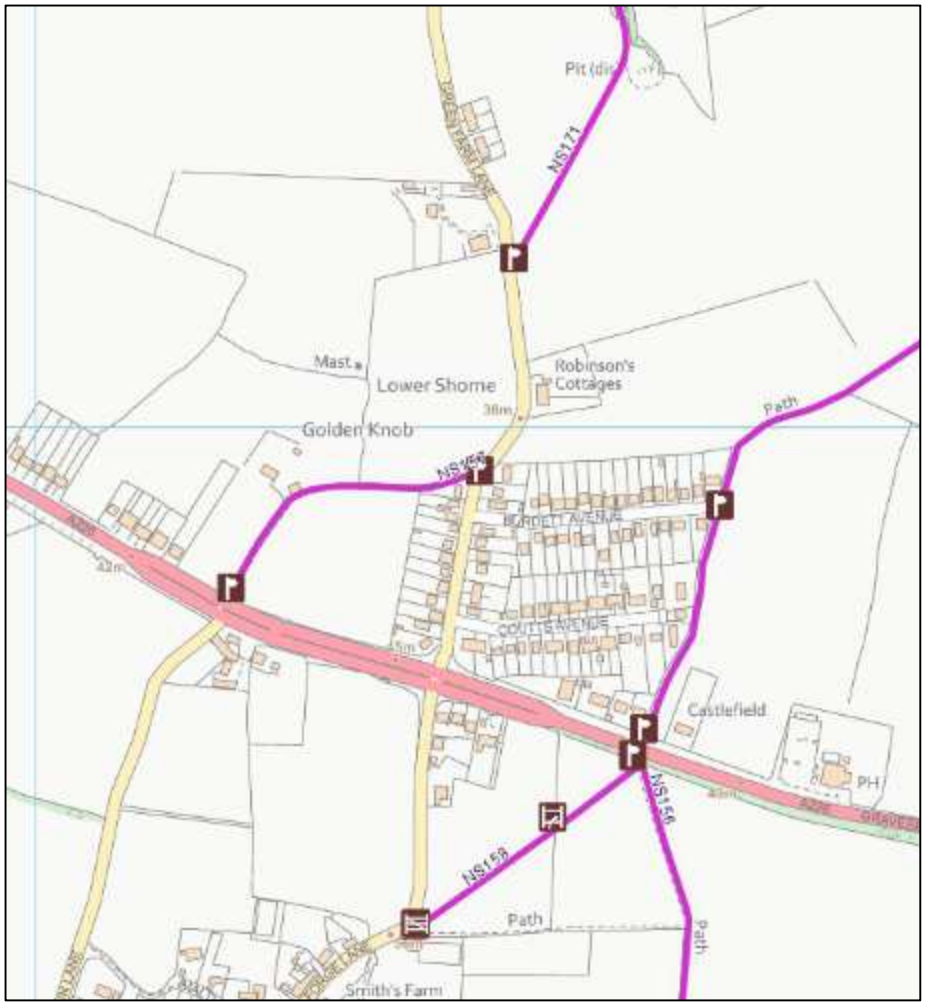
	 National Cycle Route 1 also passes through the settlement of Lower Higham, which is a long-distance cycle route stretching from Dover to the Shetland Islands.
Rail infrastructure	The nearest train station is Higham Station, which is located within the settlement itself. Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. During the peak and off-peak hours there are 2 direct services per hour. During the morning / evening peaks Higham station is also served by 4 direct train services operated by Southeastern. These run between Strood and Charing Cross / Cannon Street. It is also possible to change at Gravesend and board HS1 services into London St Pancras International. This route option is available twice per hour throughout the day.
Key amenities and services*	The settlement of Lower Higham has limited local amenities that includes only a car garage. A Primary School can also be found just outside Lower Higham between Higham and Lower Higham and can be accessed on foot via a pedestrian footway.
Closest settlements	• Higham – 1.6km • Gravesend – 9.5km
from GBC 2017 settlement paper	

5.14 Lower Shorne

5.14.1 The figure and table below summarise the transport network serving Lower Shorne.

Topic	Notes
Population*	Unknown
Highway infrastructure	The settlement of Lower Shorne is located on the north side of the A226 Gravesend Road. The A226 is a single carriageway road with one lane in each direction. Approximately 6.1km to the west the A226 passes directly through Gravesend and continues to connect to Dartford. Approximately 2.9km to the east it connects to the A289 and the A2, which allows access to the wider strategic highway network. The A226 is subject to a 50mph speed limit when passing the village of Lower Shore. The main junction into the village is Green Farm Lane.
Bus infrastructure	There are 4 bus services which regularly serve the settlement of Lower Shorne. These are described in the table below.

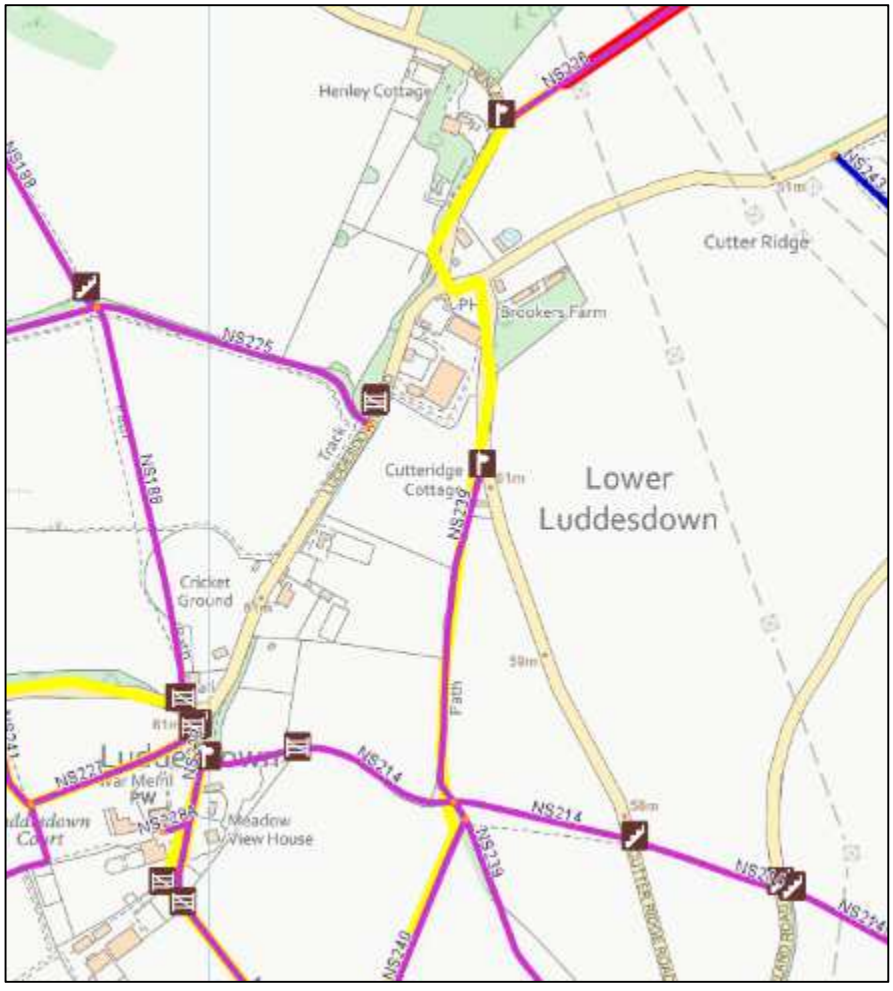
Service No.	Description	Weekdays	Saturday	Sunday
190	Chatham – Rochester – Strood – Chalk – Gravesend	3 services per hour	3 services per hour	1 service per hour
417	Gravesend – Shorne – Cliffe	3 services per day	3 services	No services
416	Gravesend – Shorne - Meopham	5 services per day	3 services	No services
736	Gravesend – Higham – Northfleet – London	Peak hours only	No services	No services

	In the settlement of Lower Shorne there are two bus stops. One is located on the A226 Gravesend Road beside the Shorne crossroads and serves the 190, 417, 416 and 736. The other is located on Forge Lane and serves the 417 and 416. The 190 service is the most regular service and takes 15 minutes to reach Gravesend and 20 minutes to reach Chatham. Towards Gravesend the first service of the day stops in Lower Shore at 05:30 and the last bus stops at 18:53. Towards Chatham the first bus stops in Lower Higham at 06:07 and the last bus stops at 19:33.
Walking and cycling infrastructure	On the A226 within the settlement there are pedestrian footways on at least one side of the carriageway. This road is also lit. Within the residential roads of the settlement there are limited pedestrian footways and little street lighting The A226 has cycle lanes in both directions within the settlement. These connect to Gravesend to the west and Strood to the east. There are several Public Rights of Way which are accessible from Lower Shorne. 
Rail infrastructure	The closest rail station can be found in Lower Higham, which is approximately 3.4km to the north east.

	Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. During the peak and off-peak hours there are 2 direct services per hour. During the morning / evening peaks Higham station is also served by 4 direct train services operated by Southeastern. These run between Strood and Charing Cross / Cannon Street. It is also possible to change at Gravesend and board HS1 services into London St Pancras International. This route option is available twice per hour throughout the day. It is also possible to change at Gravesend and catch HS1 into London St Pancras International. Alternatively, Gravesend train station is 6.5km away and serves train services on Southeastern and Govia Thameslink lines. Between 0700-0800 there are 8 direct trains into various London stations and between 1700-1800 there are 10 direct trains to Gravesend from various London stations. During the off peak hour hours there are approximately 6 trains per hour.
Key amenities and services*	Lower Shorne has no significant local amenities. However, the settlement of Shorne is located a short distance to the south (0.6km) and has amenities such as a convenience store, pub, primary school, GP surgery and church.
Closest settlements	• Shorne – 0.8km • Higham – 1.8km • Gravesend – 6.1km
**from GBC 2017 settlement paper*	

5.15 Luddesdown

5.15.1 The figure and table below summarise the transport network serving Luddesdown.

Topic	Notes
Population*	Unknown
Highway infrastructure	There are no major A or B roads connected to the settlement of Luddesdown. The A227 (Wrotham Road) is located approximately 2.9km to the west of the settlement and accessible via Oakenden Road and Foxendown Lane. These are unlit single-track lanes with occasional passing areas. The A227 connects to the A2 in the north and the M20 to the south. The A227 is a single carriageway road with one lane in each direction. It has a varying speed limit that is usually 30mph through settlements and 40mph outside the settlements.
Bus infrastructure	There are no regular bus services which serve the settlement of Luddesdown.
Walking and cycling infrastructure	The settlement has no pedestrian footways and no street lighting. The roads are generally narrow lanes. Luddesdown is connected to several Public Rights of Way. It is also connected to the Luddesdown Trek (shown in yellow). 
Rail infrastructure	The nearest train station is Sole Street, which is located approximately 3.2km to the north west of Luddesdown. There are no footways linking the settlement with the rail station. This station is served by Southeastern trains that run between Sheerness-on-Sea and London Victoria once per hour during the off peak period and 3 times per hour

	during the AM and PM peaks. One of these services during the peaks runs between Sole Street and London Blackfriars. Alternatively, Meopham station is approximately 4.7km north from Luddesdown and has a greater number of trains per hour. It is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	The settlement of Luddesdown has limited amenities which includes a pub, a church and a community hall.
Closest settlements	• Meopham – 2.7km • Hook Green – 4.3km • Istead Rise – 6.9km • Gravesend – 11.2km
from GBC 2017 settlement paper	

5.16 Meopham Green

5.16.1 The figure and table below summarise the transport network serving Meopham Green

Topic	Notes
Population*	1,663

<table>
<tr><td>Highway infrastructure</td><td>The settlement of Meopham Green is directly connected to the A227 Wrotham Road which passes through the settlement. Approximately 6.3km to the north is the A2 and approximately 7km to the south is the M20 westbound.

The A227 is a single carriageway road with one lane in each direction. It has a varying speed limit that is usually 30mph through settlements and 40mph outside the settlements.

Through the settlement of Meopham Green the A227 is subject to a 30mph speed limit and has numerous junctions leading to residential streets.</td></tr>
<tr><td>Bus infrastructure</td><td>There are three bus services which regularly serve the settlement of Meopham Green. These are described in the table below.
<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>769</td><td>Vigo – Meopham – Instead Rise – London</td><td>Peak hours only</td><td>No services</td><td>No services</td></tr>
<tr><td>308/306</td><td>Bluewater – Gravesend – Meopham – Vigo – Borough Green – Sevenoaks</td><td>1 service per hour</td><td>1 service per hour</td><td>No services</td></tr>
<tr><td>416</td><td>Gravesend – Shorne - Meopham</td><td>5 services per day</td><td>3 services</td><td>No services</td></tr>
</table>
There are several bus stops along the A227 in the settlement of Meopham Green. To the north of the settlement there is one located outside Meopham School and to the south there is one opposite Steele’s Lane. There are also another two stops in between

The 308/306 is the most regular bus service and takes 20 minutes to reach Gravesend and 50 minutes to reach Sevenoaks.

Towards Gravesend the first bus of the day stops in Meopham Green at 07:22 and the last bus stops at 23:34.

Towards Sevenoaks the first bus of the day stops at 05:52 and the last bus stops at 23:50.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>The A227 through the settlement and the residential roads have pedestrian footways on at least one side of the carriageway. Limited street lighting is provided.

Through the settlement there are limited pedestrian crossing facilities. The only formal crossing point is a pelican crossing located outside Meopham school.

There are no cycle facilities. However, the main road through the settlement is a 30mph single carriageway road with one lane in each direction demarked by a central dashed line.

There are several Public Rights of Way, a Bridleway and several Byways which connect to Meopham Green. Meopham Green also allows access to the ‘Meopham Walk’ (shown in yellow.</td></tr>
</table>

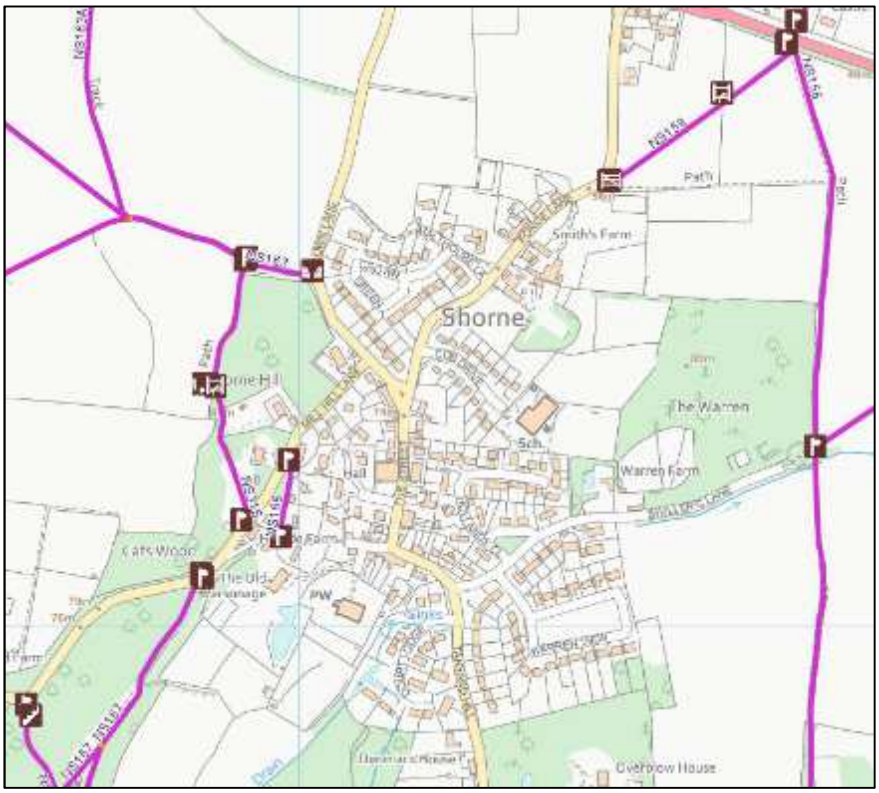
Rail infrastructure	The nearest train station is Meopham station in Hook Green, which is approximately 2.9km north from the settlement. A footway is provided between the settlement and this station. Meopham station is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	The settlement of Meopham Green has a variety of local amenities, including 3 pubs, a medical centre, a veterinary clinic, a police station, a dentist, a secondary school, a library and a church.
Closest settlements	• Meopham – 0.5km • Hook Green – 2.3km • Istead Rise – 5.3km • Gravesend – 9.7km
**from GBC 2017 settlement paper*	

5.17 Shorne

The figure and table below summarise the transport network serving Shorne

Topic	Notes
Population*	743
Highway infrastructure	Shorne is not directly connected to any major A or B roads. The A226 (Gravesend Road) is located 0.6km to the north via Forge Lane. The A226 is a single carriageway road with one lane in each direction. To the west the A226 passes directly through Gravesend and continues to connect to Dartford. To the east it connects to the A289. The A2 is also located a short distance away (approximately 2km) to the south, via The Street, Tanyard Hill, The Ridgeway and Brewers Road. The A2 allows access to the wider strategic highway network. Through the settlement of Shorne, along The Street and Tanyard Hill, the roads are subject to a 30mph speed limit.
Bus infrastructure	There are two regular bus services that serve the settlement of Shorne. These are described in the table below.

Service No.	Description	Weekdays	Saturday	Sunday
417	Gravesend – Shorne – Cliffe	3 services per day	3 services	No services
416	Gravesend – Shorne - Meopham	5 services per day	3 services	No services

	There is one bus stop in the centre of Shorne along The Street, opposite the village hall. The first bus of the day towards Gravesend stops in Shorne at 07:30 and the last one stops at 16:48. Towards Meopham the first bus stops at 10:37 and the last stops at 18:06. On these services it takes 20 minutes to reach Gravesend and 15 minutes to reach Meopham. Alternatively, approximately 0.8km (10-minute walk) north on the A226 is a bus stop (Shorne Crossroads), which is served by bus service 190. This runs between Chatham and Gravesend, with a frequency of 3 services per hour Monday to Saturday and 1 service per hour on Sundays. Towards Gravesend the first 190 bus of the day stops at 05:30 and the last bus stops at 18:53. Towards Chatham the first 190 bus stops at 06:07 and the last bus stops at 19:33.
Walking and cycling infrastructure	Within the settlement the majority of roads are fronted by pedestrian footways on at least on side of the carriageway, but there is no street lighting. There are no cycle facilities. However, the main road through the settlement is a 30mph single carriageway road with one lane in each direction demarked by a central dashed line. There are limited pedestrian crossing points. Shorne has several accessible Public Rights of Way. 
Rail infrastructure	The closest rail station can be found in Lower Higham, which is approximately 4.1km to the north east. Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. During the peak and off-peak hours there are 2 direct services per hour.

	During the morning / evening peaks Higham is also served by 4 direct train services operated by Southeaster. These run between Strood and Charing Cross/Cannon Street. It is also possible to change at Gravesend and catch HS1 into London St Pancras International. Alternatively, Gravesend train station is 6.8km away and serves train services on Southeastern and Govia Thameslink lines. Between 0700-0800 there are 8 direct trains into various London stations and between 1700-1800 there are 10 direct trains to Gravesend from various London stations. During the off-peak hour hours there are approximately 6 trains per hour.
Key amenities and services*	The settlement of Shorne has several local amenities, such as a convenience store, pub, primary school, GP surgery and church.
Closest settlements	
*from GBC 2017 settlement paper	

5.18 Shorne Ridgeway

5.18.1 The figure and table below summarise the transport network serving Shorne Ridgeway.

Topic	Notes
Population*	271

<table>
<tr><td>Highway infrastructure</td><td>Whilst Shorne Ridgeway is not directly connected to any major A or B roads the A226 Gravesend Road is located 1.7km to the north via Tanyard Hill, The Street and Forge Lane. These are single carriageway roads with one lane in each direction.

The A2/M2 is also located a short distance away (approximately 1km) to the south, via The Ridgeway and Brewers Road. The A2/M2 allows access to the wider highway network.

The A226 is a single carriageway road with one lane in each direction. To the west the A226 passes directly through Gravesend and continues to connect to Dartford. To the east it connects to the A289.

Through the settlement of Shorne Ridgeway along The Ridgeway and Tanyard Hill, the road is subject to a 30mph speed limit and fronted by houses on at least one side of the carriageway. The road is typically used by parked cars on one side of the carriageway.</td></tr>
<tr><td>Bus infrastructure</td><td>There are two regular bus services that serve the settlement of Shorne Ridgeway. These are described in the table below.

<table><tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr><tr><td>417</td><td>Gravesend – Shorne – Cliffe</td><td>3 services per day</td><td>3 services</td><td>No services</td></tr><tr><td>416</td><td>Gravesend – Shorne - Meopham</td><td>5 services per day</td><td>3 services</td><td>No services</td></tr></table>
There is one bus stop in Shorne Ridgeway which is located on Tanyard Hill, opposite Racefield Close.

The first bus of the day towards Gravesend stops in Shorne Ridgeway at 07:32 and the last bus stops at 16:50.

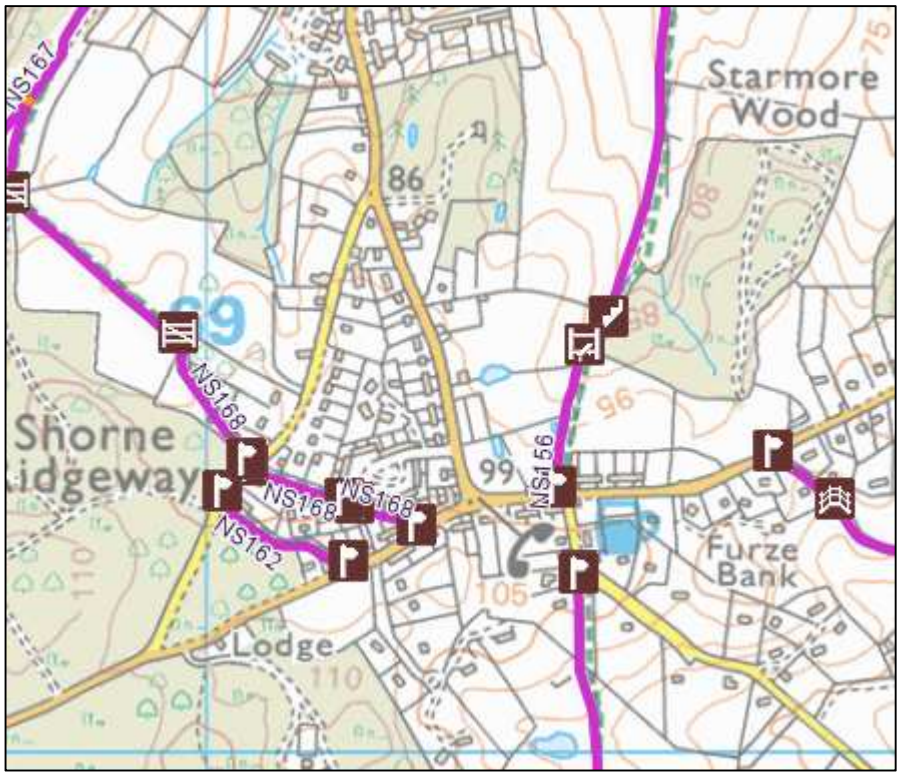
Towards Meopham the first bus of the day stops at 10:41 and the last bus stops at 18:10.

On these services it takes 25 minutes to reach Gravesend and 15 minutes to reach Meopham.</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>Through the settlement there are limited pedestrian footways and crossing points.

The main roads through the settlement (The Ridgeway and Tanyard Hill) are unlit, but the residential streets have regular street lighting.

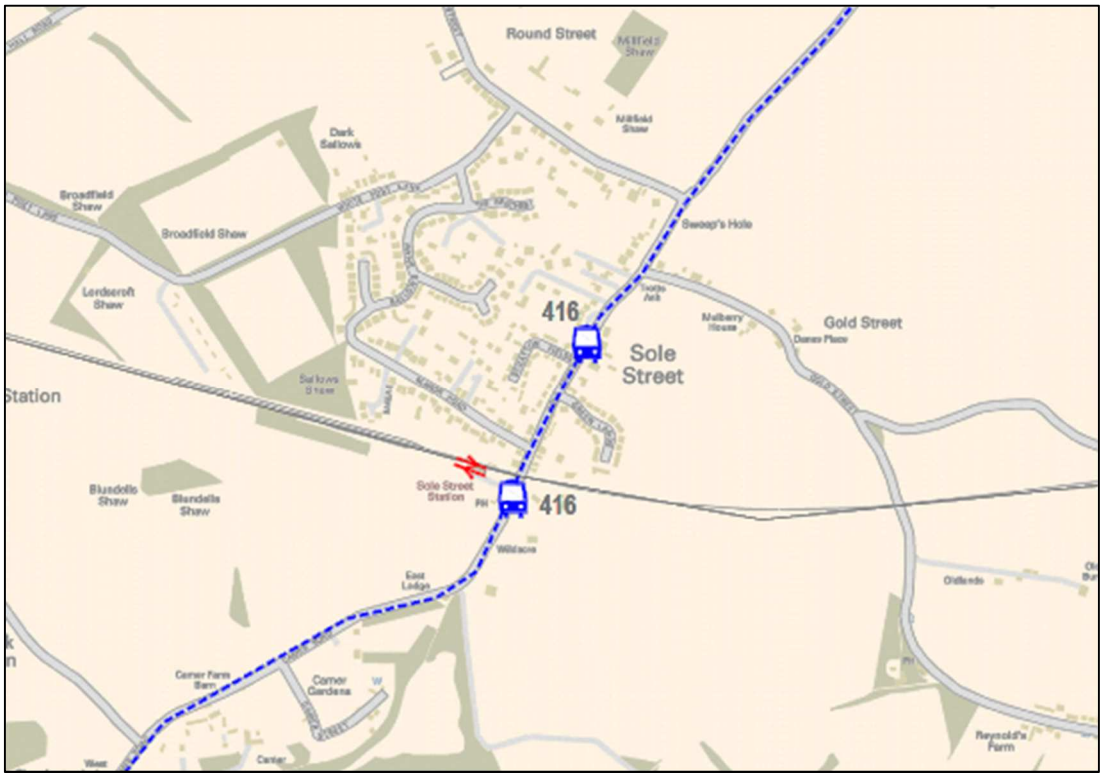
There are no cycle facilities, however the roads within the settlement are single carriageway roads with one lane in each direction demarked by a central dashed line.

Shorne Ridgeway is connected to several Public Rights of Way</td></tr>
</table>

	
Rail infrastructure	The closest rail station can be found in Lower Higham, which is approximately 3.5km to the north east. Higham station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. During the peak and off-peak hours there are 2 direct services per hour. During the morning / evening peaks Higham station is also served by 4 direct train services operated by Southeastern. These run between Strood and Charing Cross / Cannon Street. It is also possible to change at Gravesend and board HS1 services into London St Pancras International. This route option is available twice per hour throughout the day. Alternatively, Gravesend train station is 7.7km away and serves train services on Southeastern and Govia Thameslink lines. Between 0700-0800 there are 8 direct trains into various London stations and between 1700-1800 there are 10 direct trains to Gravesend from various London stations. During the off-peak hour hours there are approximately 6 trains per hour.
Key amenities and services*	The settlement of Shorne Ridgeway has limited local amenities but includes a pub and a recreational ground.
Closest settlements	• Shorne – 0.8km • Higham – 1.9km • Gravesend – 9km
**from GBC 2017 settlement paper*	

5.19 Sole Street

5.19.1 The figure and table below summarise the transport network serving Sole Street.



Topic	Notes
Population*	672
Highway infrastructure	The settlement of Sole Street is not located on a major A or B road. The A227 (Wrotham Road) is located approximately 1.7km away to the west via Sole Street, Camer Road and Green Lane. The A227 connects to the A2 in the north and the M20 to the south. The A227 is a single carriageway road with one lane in each direction. The A2 is located 3.4km to the north via Jeskyns Road and Henhurst Lane, or via The Street and Halfpence Lane. Through Sole Street the main road (Sole Street) is subject to a 30mph speed limit.
Bus infrastructure	Sole Street is served by one regular bus service, the 416, which stops on Sole Street opposite Scratton Fields and also opposite Sole Street train station. This service runs between Gravesend and Meopham via Shorne and Cobham. On weekdays there a 5 services per day. On Saturdays there are 3 services and there are no services on Sundays. The first bus of the day stops in Sole Street at 07:22 and the last bus stops at 16:40. The first bus of the day towards Meopham stops at 10:51 and the last bus stops at 18:20. This service takes 40 minutes to reach Gravesend and 5 minutes to reach Meopham.

Walking and cycling infrastructure	The majority of the roads within the settlement have pedestrian footways on at least one side of the road. However White Post Lane and Round Street are narrow lanes without pedestrian footways. There are very few pedestrian crossings, which, where present, are exclusively dropped kerb crossings. There are no cycle facilities within the settlement. Sole Street has access to multiple Public Rights of Way and Bridleways. The Wealdway walk is also passes through the settlement (shown in yellow).
Rail infrastructure	The nearest train station can be found in Sole Street itself. Footways within the settlement allow pedestrian access to the station. This station is served by Southeastern trains that run between Dover and London Victoria once per hour. Alternatively, Meopham station is approximately 2.4km from Sole Street and has a greater number of trains per hour. It is served by Southeastern trains that run between Dover Priory and London Victoria, and Ramsgate and London Victoria. During the peak hours trains into London run at a frequency of 4 per hour. During the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	The settlement of Sole Street has several local amenities, including a convenience store, church hall and pub.

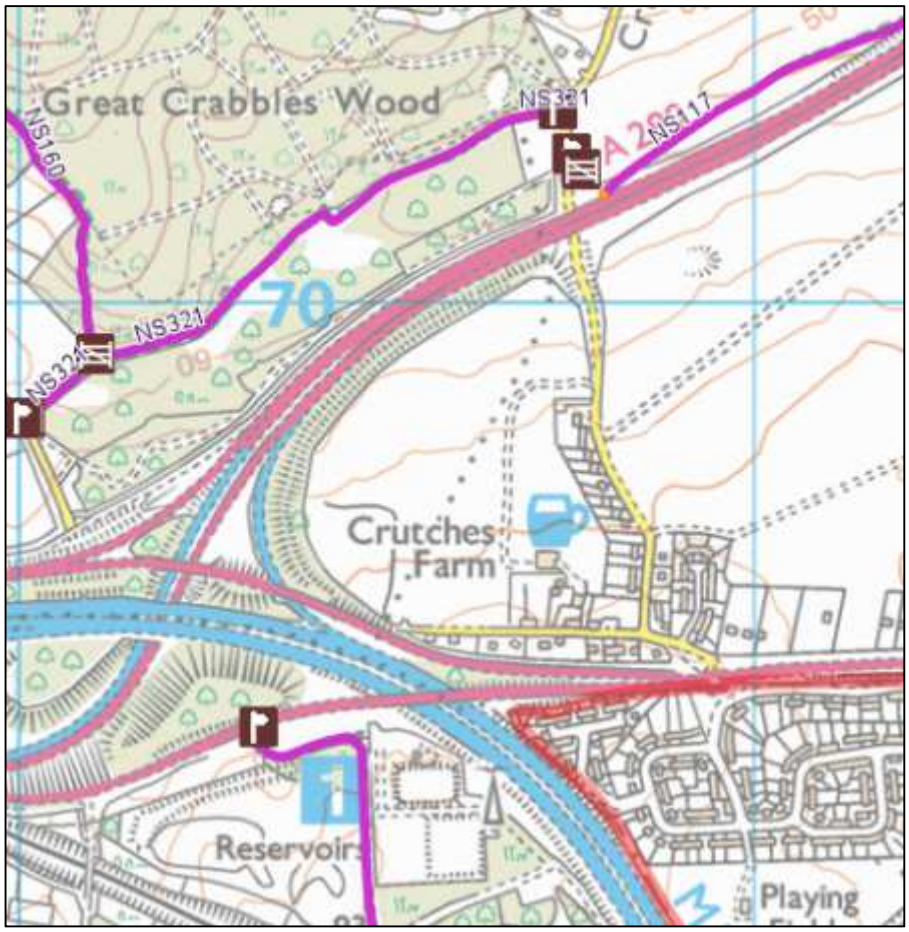
Closest settlements	• Cobham – 1.9km • Hook Green – 2.6km • Istead Rise – 4.7km • Gravesend – 8.4km
*from GBC 2017 settlement paper	

5.20 Three Crutches

5.20.1 The figure and table below summarise the transport network serving Three Crutches.

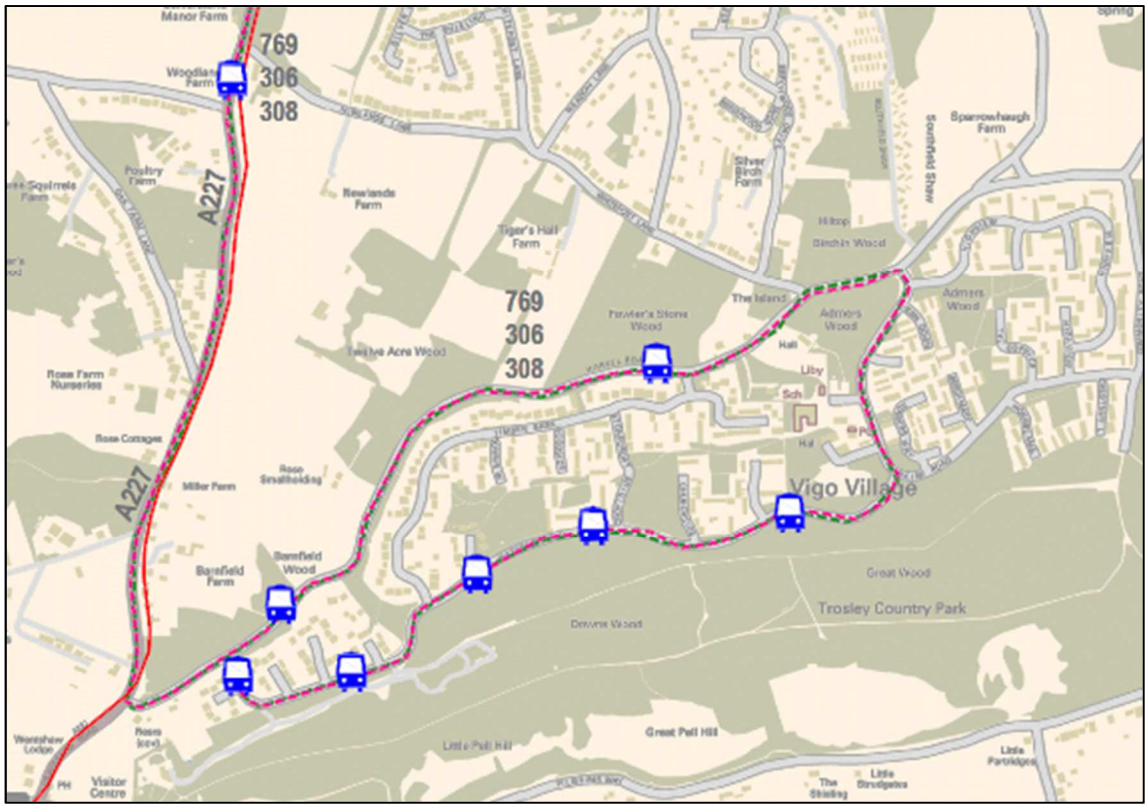
Topic	Notes
Population*	342
Highway infrastructure	Three Crutches directly connects to the A2 via the A2 / Old Watling St roundabout and is effectively an extension to the existing Strood urban area. To the east the A2 connects the settlement to the Medway Towns and to the west it connects to the A289, M2, M25 and Dartford Crossing. The A2 past this settlement is subject to a 50mph speed limit and any dwellings are set back from the road. The main roads through the settlement are Old Watling St and Crutches Ln. These are residential streets with one lane in each direction that are subject to a 30mph speed limit.
Bus infrastructure	There are 4 regular bus services which pass the settlement at Three Crutches. These are described in the table below.

<table>
<tr><td></td><td>
<table>
<tr><th>Service No.</th><th>Description</th><th>Weekdays</th><th>Saturday</th><th>Sunday</th></tr>
<tr><td>700</td><td>Chatham – Rochester – Strood – Earl Estate – Bluewater</td><td>3 per hour</td><td>3 per hour</td><td>2 per hour</td></tr>
<tr><td>763/764/765</td><td>Hoo/Snodland – Strood – London</td><td>Peak hours only</td><td>No services</td><td>No Services</td></tr>
</table>
The nearest bus stop to the village of Three Crutches is Old Watling Street.
The 700 is the most regular bus service. The first bus towards Bluewater stops in Three Crutches at 07:26 and the last bus of the day stops at 21:47.
Towards Chatham the first bus of the day stops in Three Crutches at 08:15 and the last bus stops at 22:47.
It takes 20 minutes to reach Bluewater and 20 minutes to reach Chatham.
</td></tr>
<tr><td>Walking and cycling infrastructure</td><td>
The majority of the settlement has pedestrian footways on at least one side of the carriageway, with some street lighting.
The settlement is connected to a cycle path which connects to the A2 to the west and Strood to the east.
Three Crutches has limited access to Public Rights of Way. However, National Cycle Route 177 passes directly past the settlement. This route National Route 177 will run south from Northfleet in Kent, via Rochester, Maidstone and Ashford, to join with National Route 2 on the South coast.
</td></tr>
</table>

	
Rail infrastructure	The nearest train station is located in Strood, which is 3km away. This station is served by Govia Thameslink trains between Rainham and Luton via London Bridge, London Blackfriars and London St Pancras International. It is also served by Southeastern trains between Ramsgate and London St Pancras International, and Strood and Tonbridge. Between 0700-0800 there are 7 direct trains into various London train stations and between 1700-1800 there are 8 direct trains out of London from various stations that pass through Strood. During the off-peak hours there a 6 services per hour that pass through Strood station. Strood station has 112 car parking spaces and 40 cycle stands.
Key amenities and services*	The local amenities in the settlement of Three Crutches are limited to a pub.
Closest settlements	• Strood – 2.3km
**from GBC 2017 settlement paper*	

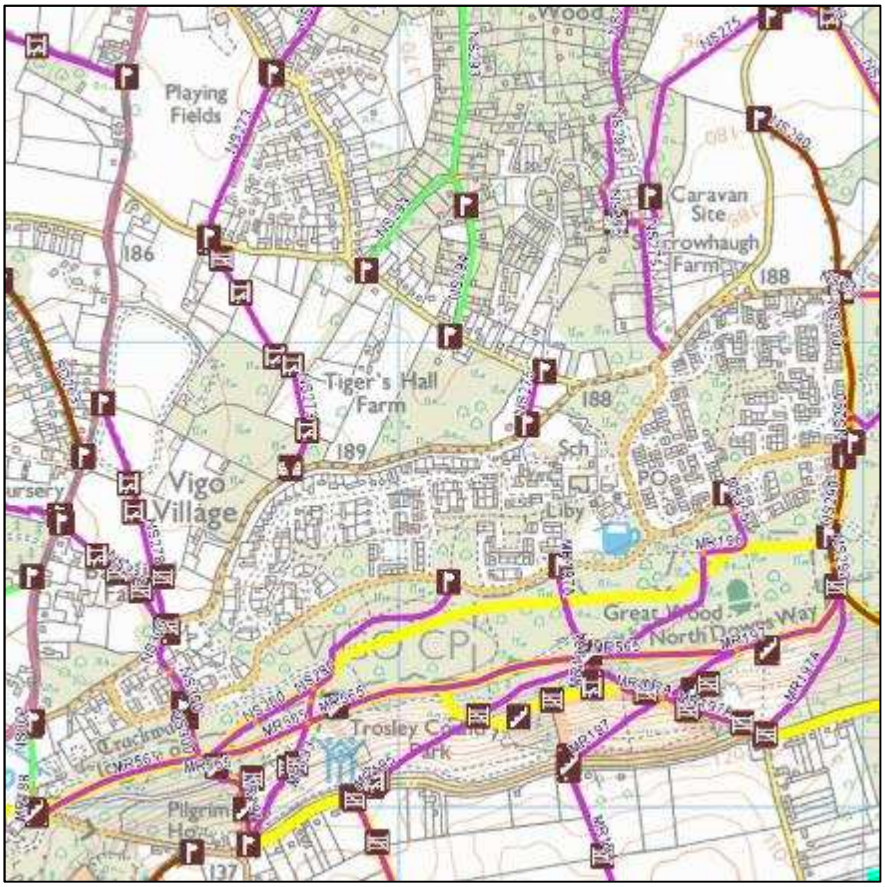
5.21 Vigo

5.21.1 The figure and table below summarise the transport network serving Vigo.



Topic	Notes
Population*	2,028
Highway infrastructure	The settlement of Vigo is located to the east of the A227 (Wrotham Road) and can be accessed from the A227 via Harvel Road within approximately 200m. The A227 is a single carriageway road with one lane in each direction. It has a variable speed limit that is usually 30mph through settlements and 40mph outside the settlements. Approximately 11.6km north along the A227 gives access to the A2/M2 and approximately 3.7km south along the A227 gives access to the M20 westbound. The main roads through the settlement of Vigo comprise Harvel Road, Waterlow Road and Erskine Road. Harvel Road is subject to the national speed limit, while all other roads inside the settlement are subject to a 30mph speed limit.
Bus infrastructure	There are several bus services that frequently service the settlement of Vigo. These are described in the table below.

Service No.	Description	Weekdays	Saturday	Sunday
769	Vigo – Meopham – Instead Rise – London	Peak hours only	No services	No services
308/306	Bluewater – Gravesend – Meopham – Vigo – Borough Green – Sevenoaks	1 service per hour	1 service per hour	No services

	There are several bus stops throughout the settlement of Vigo. There are five located along Waterlow road and two located along Harvel Road. The 308/306 is the most regular bus service and takes 30 minutes to reach Gravesend and 40 minutes to reach Sevenoaks. The first bus of the day towards Gravesend stops in Vigo at 07:14 and the last bus stops at 23:27. Towards Sevenoaks the first bus of the day stops in Vigo at 06:03 and the last bus of the day stops at 23:59.
Walking and cycling infrastructure	The majority of the settlement has pedestrian footways on at least one side of carriageway but has limited street lighting. There are limited pedestrian crossing facilities. Where present, they are exclusively dropped kerb crossings. There are no designated cycle facilities within the settlement, but the road is a single carriageway road with one lane in each direction, demarked by a centre dashed white line. The settlement of Vigo has access to an array of Public Rights of Way, Bridleways and Byways. The Harvel Hike also passes close to the settlement (shown in yellow). 
Rail infrastructure	The nearest train station is Borough Green and Wrotham, which is approximately 6km to the south of Vigo. It is served by Southeastern trains that run between Ashford International and London Victoria. During the peak hours, trains into London run at a frequency of 3 per hour. During the off-peak periods they run at a frequency of 2 per hour. Alternatively, Meopham station in Hook Green is approximately 8.2km to the north of the settlement. This is also served by Southeastern trains that run between

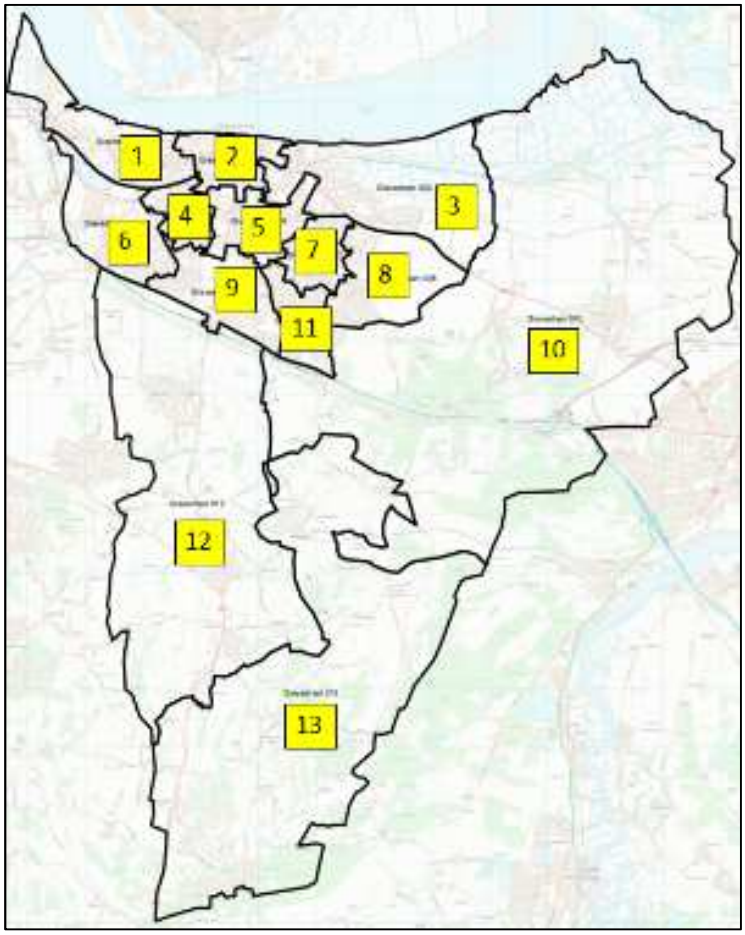
	Dover Priory and London Victoria, and Ramsgate and London Victoria, but at a greater frequency. During the peak hours trains into London run at a frequency of 4 per hour, while during the off-peak period they run at a frequency of 3 per hour. The station has 167 car parking spaces and 20 cycle spaces.
Key amenities and services*	The settlement of Vigo has several local amenities. These include a convenience store, a pharmacy, a pub, a primary school, a church, a sports field, library, community hall and a hairdresser.
Closest settlements	• Culverstone Green – 2.4km • Meopham – 5.6km • Hook Green – 7.2km
**from GBC 2017 settlement paper*	

6 Baseline census data

6.1.1 The following section summarises the extraction and analysis of census data for input to the study.

6.2 MSOAs within Gravesham

6.2.1 The figure opposite illustrates the census MSOAs within Gravesham that have been adopted for the purposes of this study.



6.2.2 Gravesham comprises 13 MSOAs of differing sizes.

6.3 Car ownership data

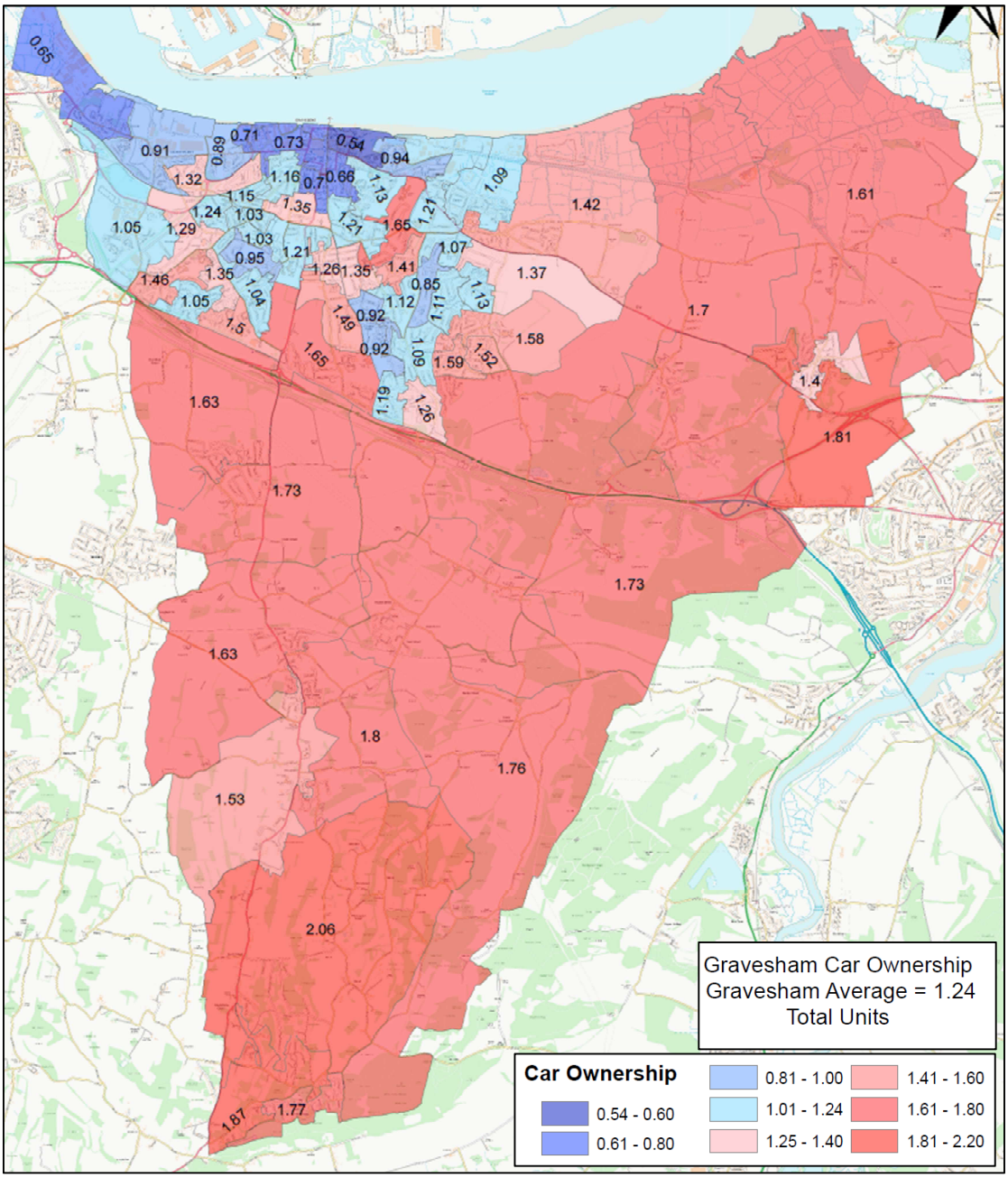
6.3.1 An exercise has been completed that reviews the existing 2011 census data evidence base with respect to car ownership. This has been completed at a Lower Super Output Area (LSOA) level.

6.3.2 The census data has been reviewed to determine the number and type of dwellings in each LSOA and the number of vehicles owned within each LSOA. The following pages provide a graphical representation of the census data.

6.3.3 Within each figure, the average value has been calculated for Gravesham and the LSOAs with a value higher than the average are shaded red, whilst those with a lower value are shaded blue. The intensity of the red or blue indicates a value increasingly removed from the average value.

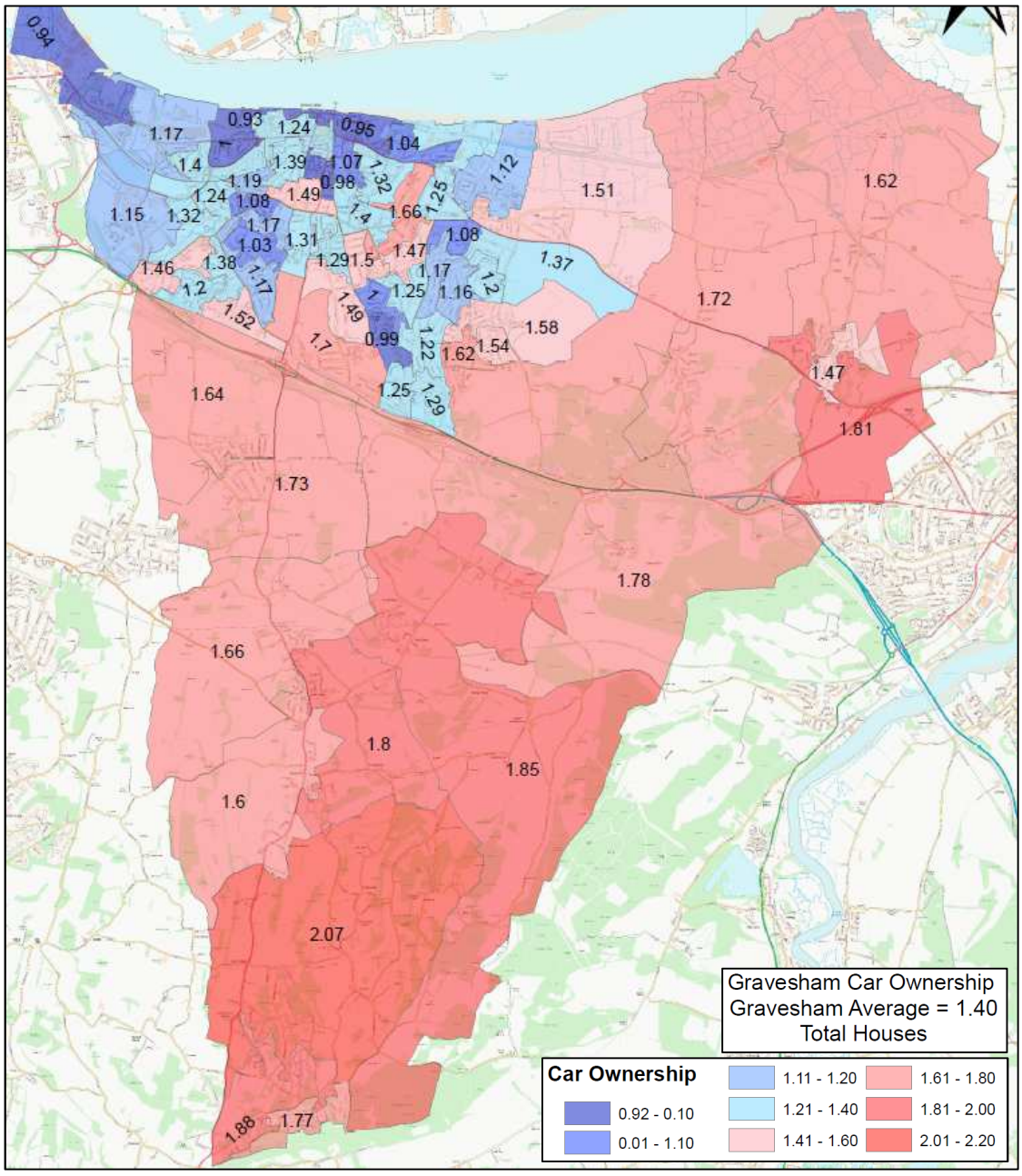
6.3.4 The figure below shows the car ownership for each LSOA within Gravesham regardless of unit size or type. The average car ownership value for Gravesham is calculated as 1.24 vehicles per dwelling.

6.3.5 It is evident from the figure below that the car ownership within Gravesham tends to be higher than the average to the south of the A2 corridor, within the rural areas. To the north of the A2 the car ownership levels are typically lower than average within the town centre and immediate surrounds.

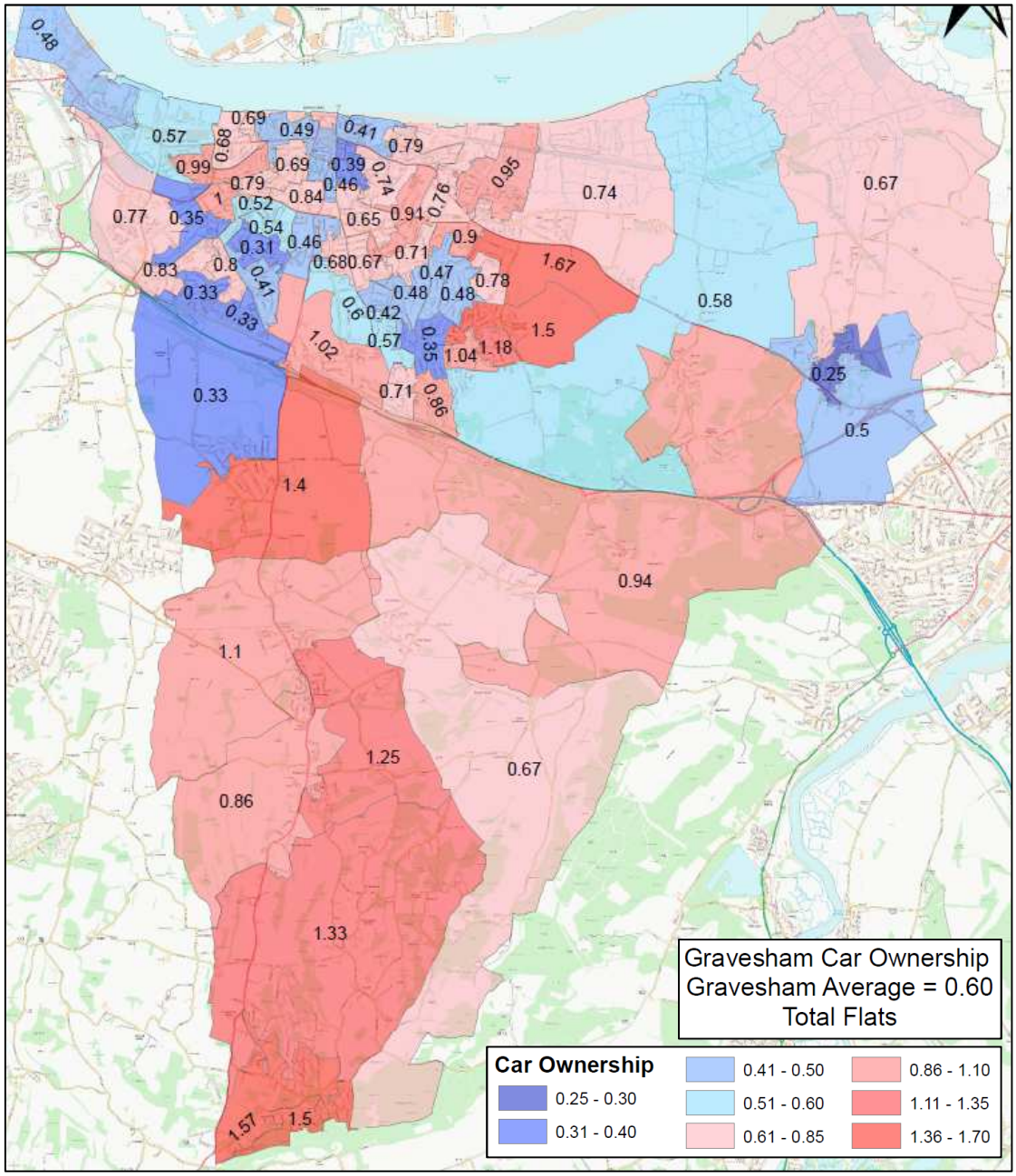


6.3.6 The figure below shows the car ownership for each LSOA within Gravesham for housing units only. The average car ownership value for Gravesham housing units is calculated as 1.40 vehicles per dwelling.

6.3.7 It is evident from the figure below that the car ownership for housing units within Gravesham tends to be higher than the average to the south of the A2 corridor, within the rural areas. To the north of the A2 the car ownership levels are typically lower than average with a few exceptions.



6.3.8 The figure below shows the car ownership for each LSOA within Gravesham for apartment units only. The average car ownership value for Gravesham housing units is calculated as 0.60 vehicles per dwelling. It is evident from the figure below that the car ownership for apartment units within Gravesham tends to be higher than the average to the south of the A2 corridor, within the rural areas. To the north of the A2 the car ownership levels are mixed.



6.4 Journey to work data

6.4.1 A review of the 2011 census journey to work data has been undertaken to provide an understanding of the movement of people between the various Mid Size Output Areas (MSOAs) within Gravesham. This provides a high level summary of where people who live within Gravesham travel to for work purposes.

6.4.2 The census data provides information for the origin and destination of work trips and the mode of travel for the following categories.

- Work from home
- Metro
- Train
- Bus

- Taxi
- Motorcycle
- Car / Van driver
- Car / Van passenger
- Cycle
- Walking
- Other

6.5 Movement matrices

6.5.1 The 13 MSOA zones have been combined with 3 external zones to derive a movement matrix within Gravesham and external to Gravesham. The 3 external zones have been generated to represent movements to the east, south and west.

6.5.2 Matrices (16 x 16) have been developed for each of the categories listed above. These provide the absolute number of person journeys between each of the 13 Gravesham MSOAs and the 3 external areas.

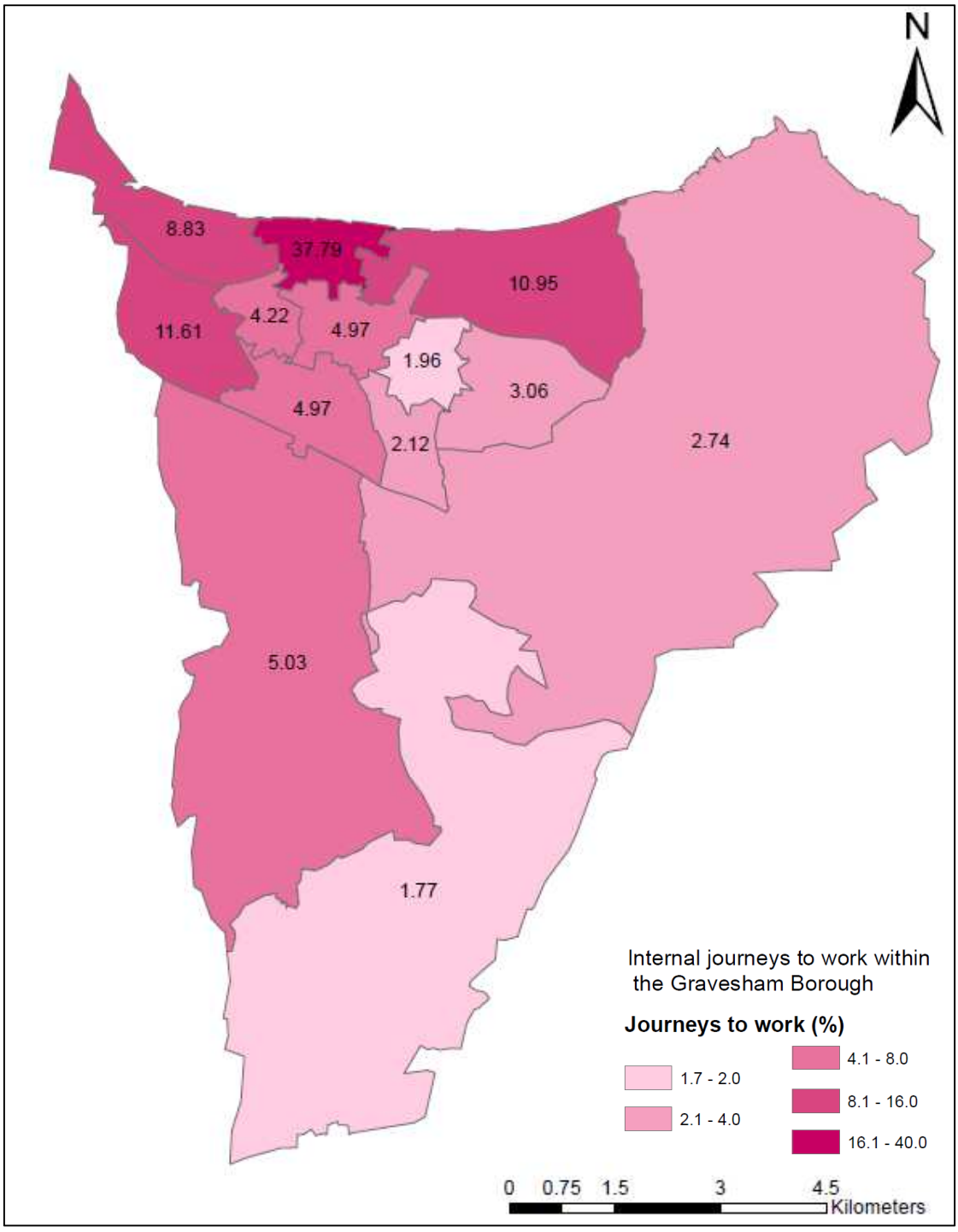
6.5.3 The matrices have also been represented as percentages to indicate the percentage mode share from each MSOA to the other MSOAs and external areas.

6.5.4 The matrix outputs are included at Appendix L1 for reference whilst the graphics and graphs below illustrate some of the key statistics from these.

6.6 High level movement pattern

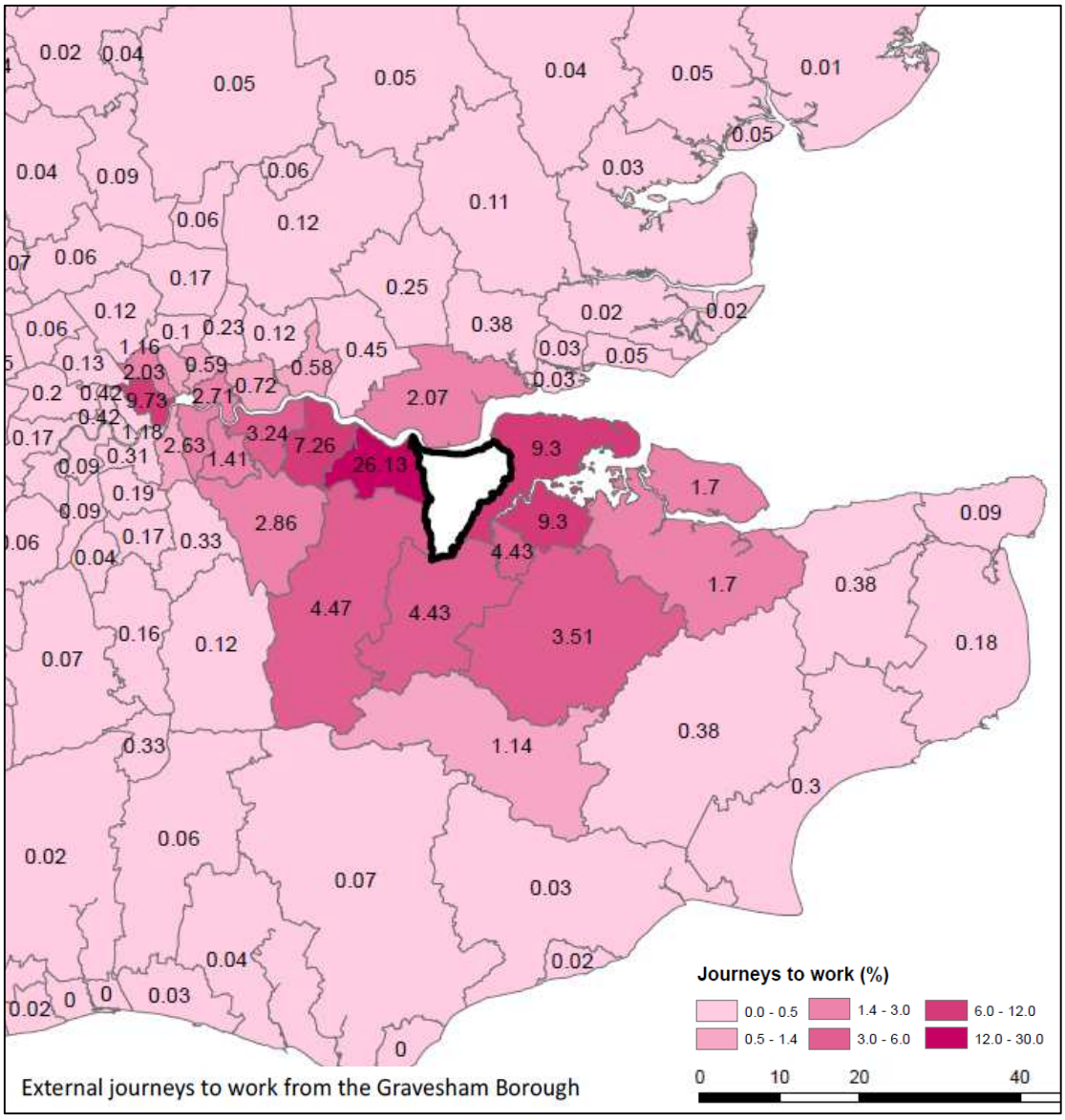
6.6.1 A high level review of the trip movement patterns has been completed based upon the census journey to work data. This has considered where residents of Gravesham, travel to work.

6.6.2 The figure below illustrates workplace percentages of Gravesham residents who also work within the borough.



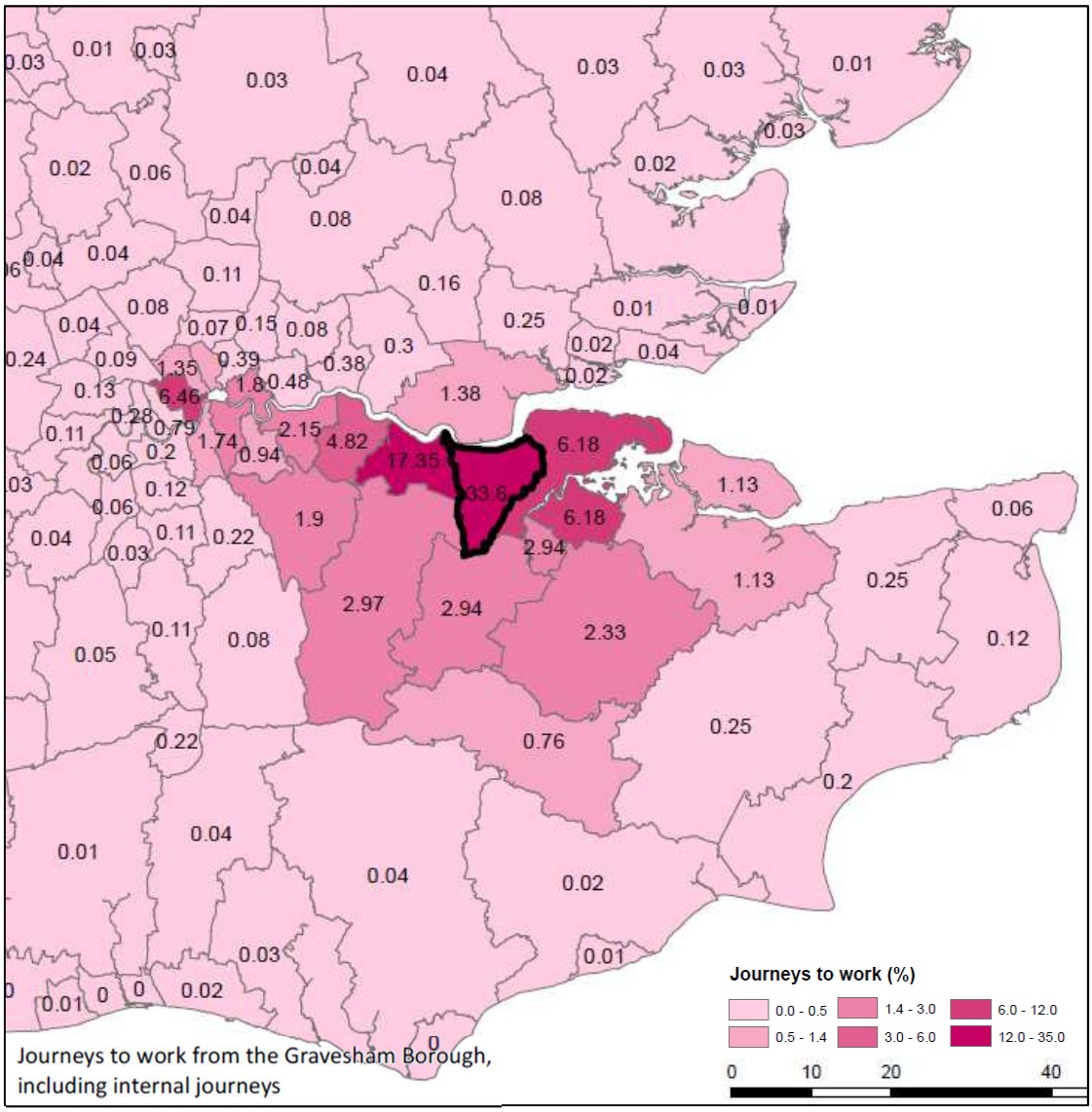
6.6.3 It is noted from the figure above that more than a third of Gravesham residents who also work within the borough do so within the town centre. It is further noted that less than 10% work within the rural areas south of the A2.

6.6.4 The figure below illustrates workplace percentages of Gravesham residents who work in areas external to the borough.



6.6.5 It is noted from the figure above that more than a quarter of Gravesham residents who work external to the borough do so within Dartford borough. Around a third travel to central London and the south east London boroughs and around a third travel the immediate neighbouring Kent districts.

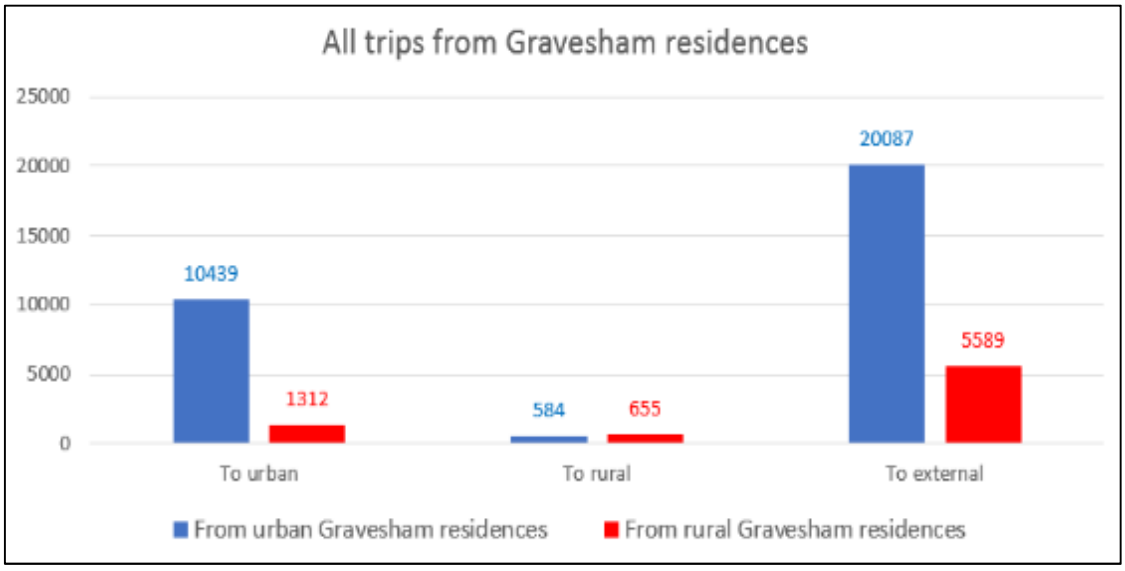
6.6.6 The figure below illustrates workplace percentages of Gravesham residents who work either in areas internal or external to the borough.

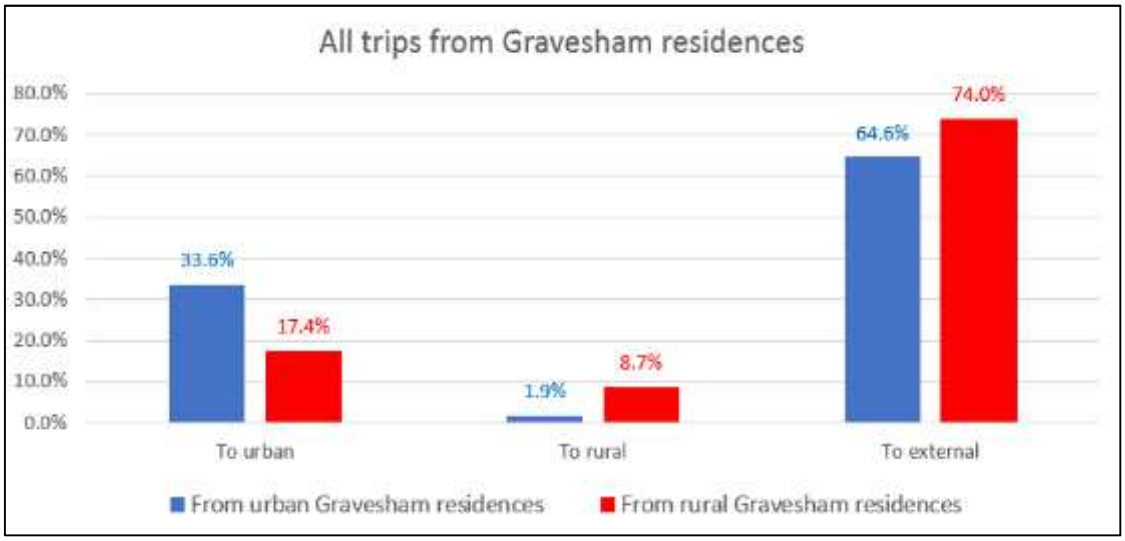


6.6.7 It is noted from the figure above that around a third of Gravesham residents also travel to work within the borough

6.6.8 An additional high level review of the trip movement patterns has been completed based upon the census journey to work data. This has considered urban MSOAs and rural MSOAs separately. The urban MSOAs have been assumed as MSOAs 001 to 009 and MSOA 011.

6.6.9 The graphs below illustrate all trips from the Gravesham MSOAs and how these are split between travelling to Urban Gravesham MSOAs, Rural Gravesham MSOAs and areas external to Gravesham altogether.



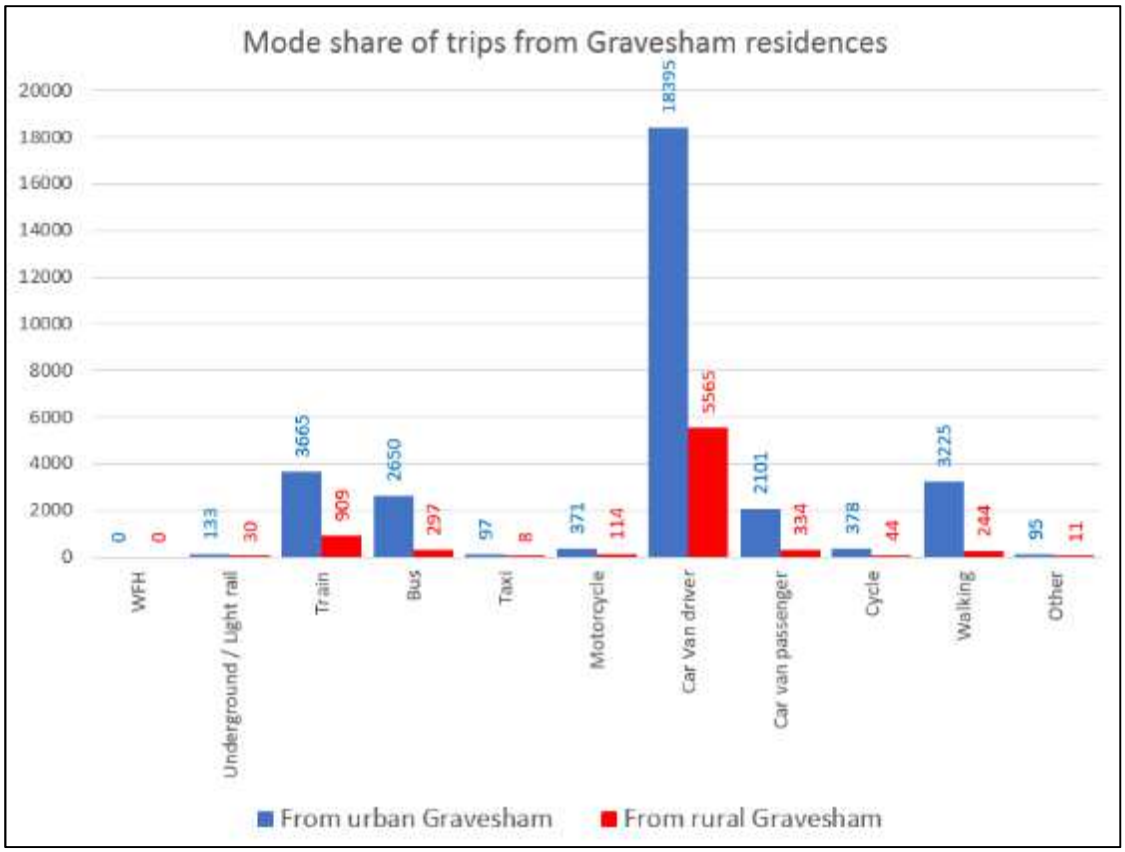


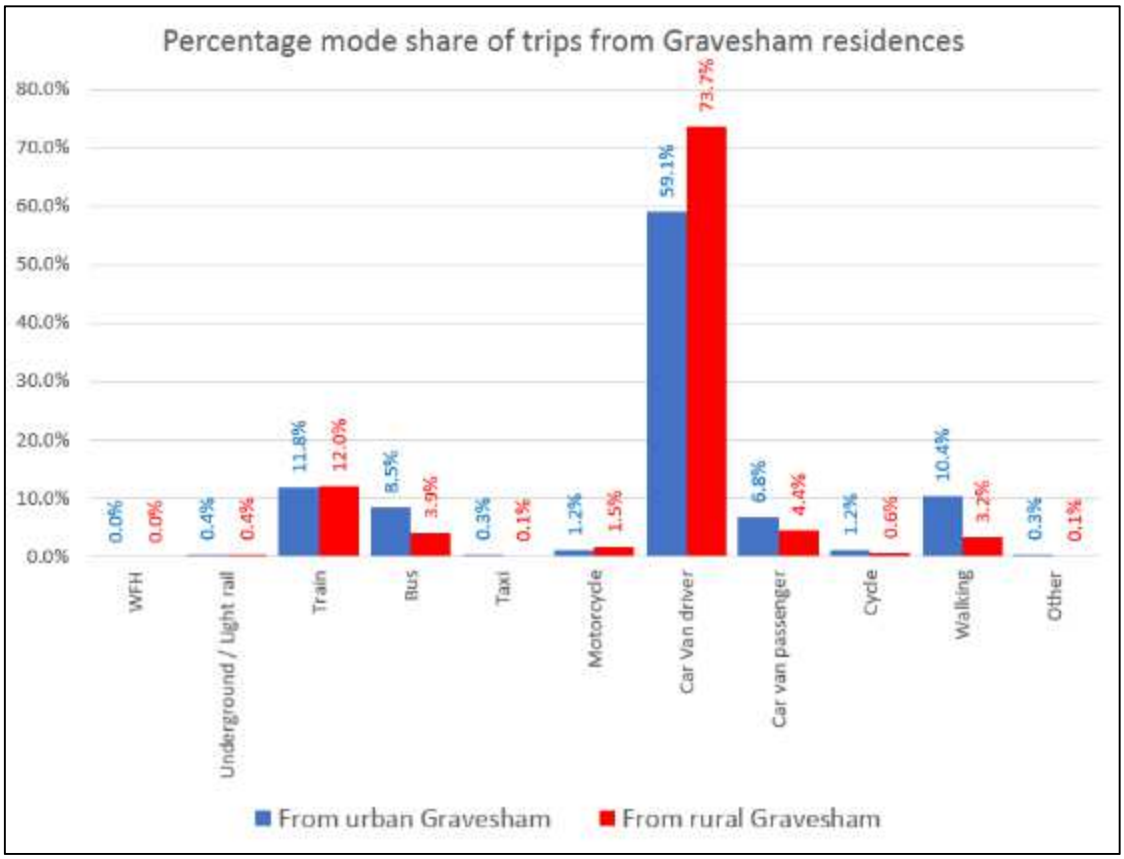
6.6.10 It is noted from the graphs above that the majority of trips generated by Gravesham MSOAs travel to areas external to Gravesham borough. This comprises 65% of trips from urban areas and 74% of trips from rural areas. Trips to rural areas are a small proportion of total trips within the borough.

6.7 Mode share

6.7.1 A high level review of the mode share patterns has been completed based upon the census journey to work data. This has also considered urban MSOAs and rural MSOAs separately.

6.7.2 The graphs below illustrate all trips from the Gravesham MSOAs and how these are split between modes.





6.7.3 It is noted from the graphs above that car and van driver mode accounts for the majority of trips. It is further noted that whilst the train mode share percentage is similar for urban and

rural areas, the bus, cycle and walk mode shares are significantly greater for urban areas when compared to rural.

6.8 Journeys by mode

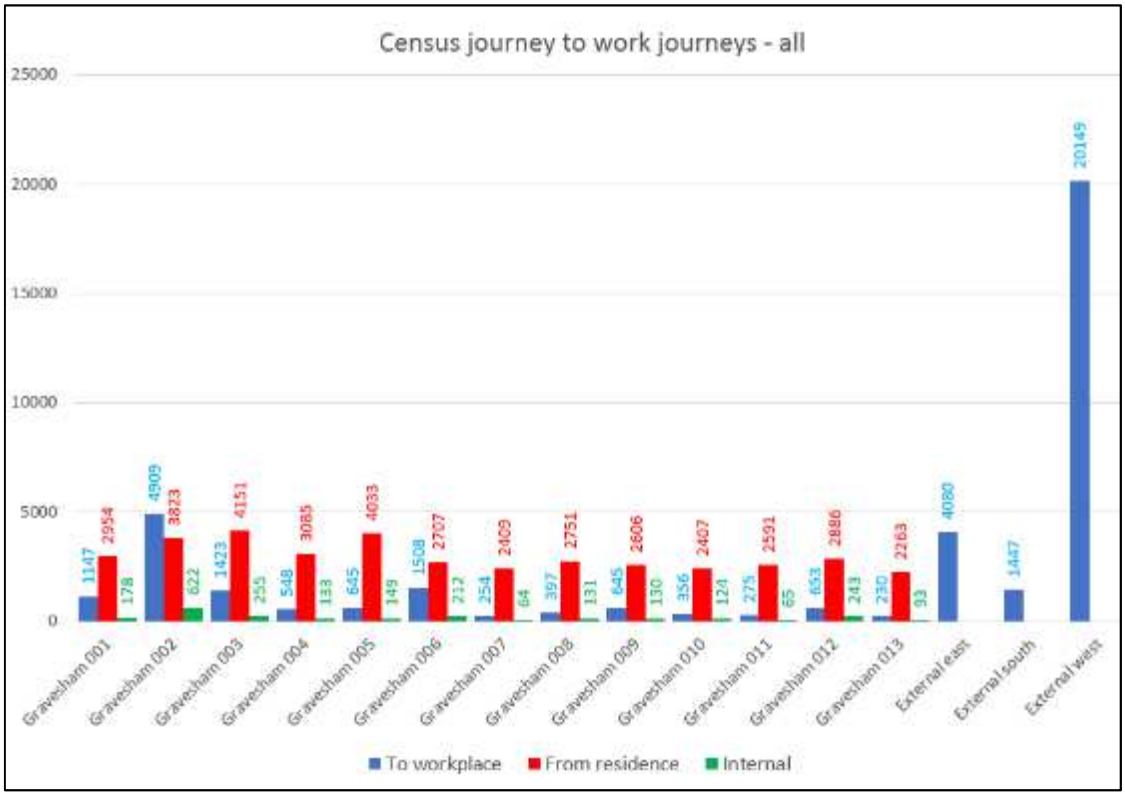
6.8.1 The graphs below summarise the statistics in further detail by illustrating the following :

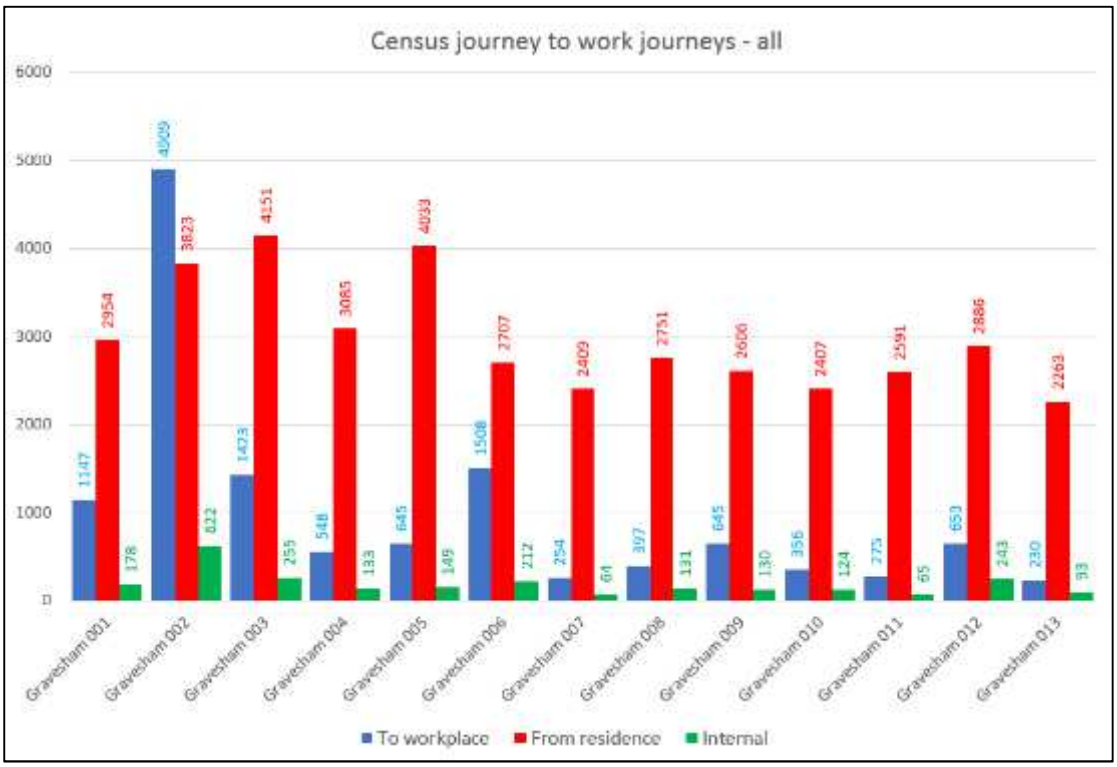
- The blue columns represent where all census journey to work trips from the combined Gravesham MSOAs travel to.
- The red columns represent how many census journey to work trips originate from each Gravesham MSOA.
- The green columns indicate how many census journey to work trips are internal to each Gravesham MSOA.

6.8.2 Two graphs have been shown for each mode category showing number of trips. This has been done because the “external west” trips represent a significant proportion of trips and skew the vertical scale for the remainder of the graph. Hence, the top graph for each mode category shows all trips, whilst the second graph excludes external trips.

6.8.3 A third graph is also shown that shows the percentage mode share for each mode. This allows a relative comparison between each MSOA for each mode.

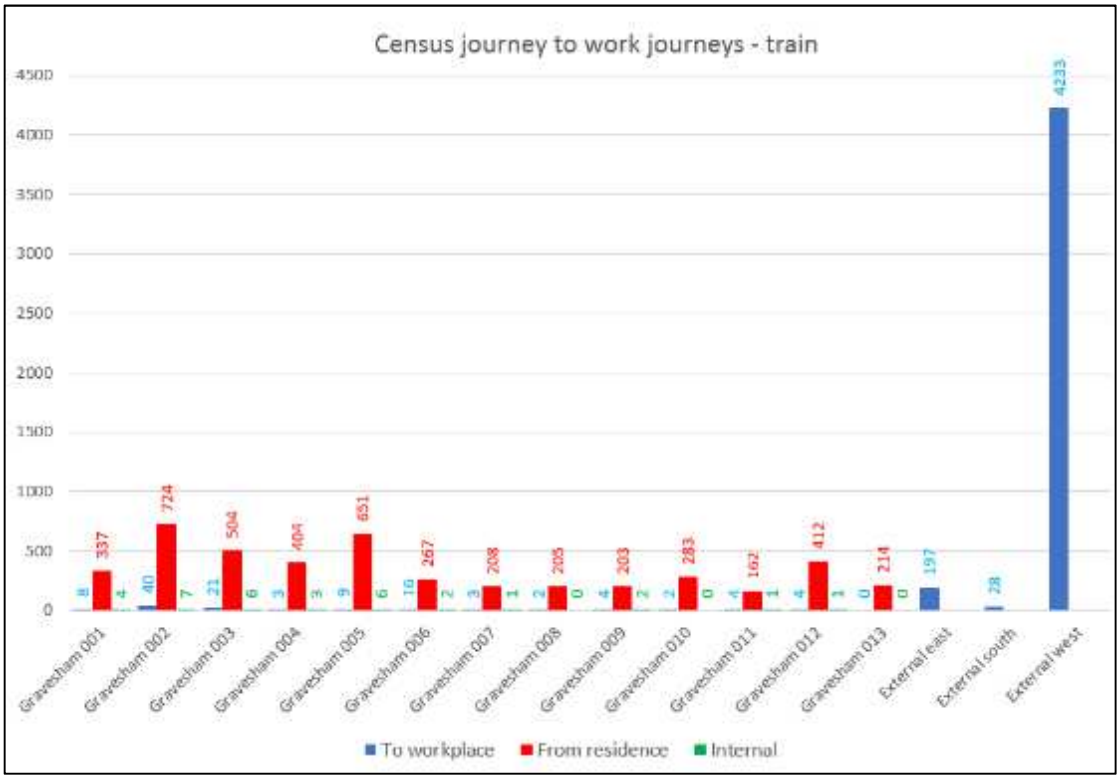
All modes

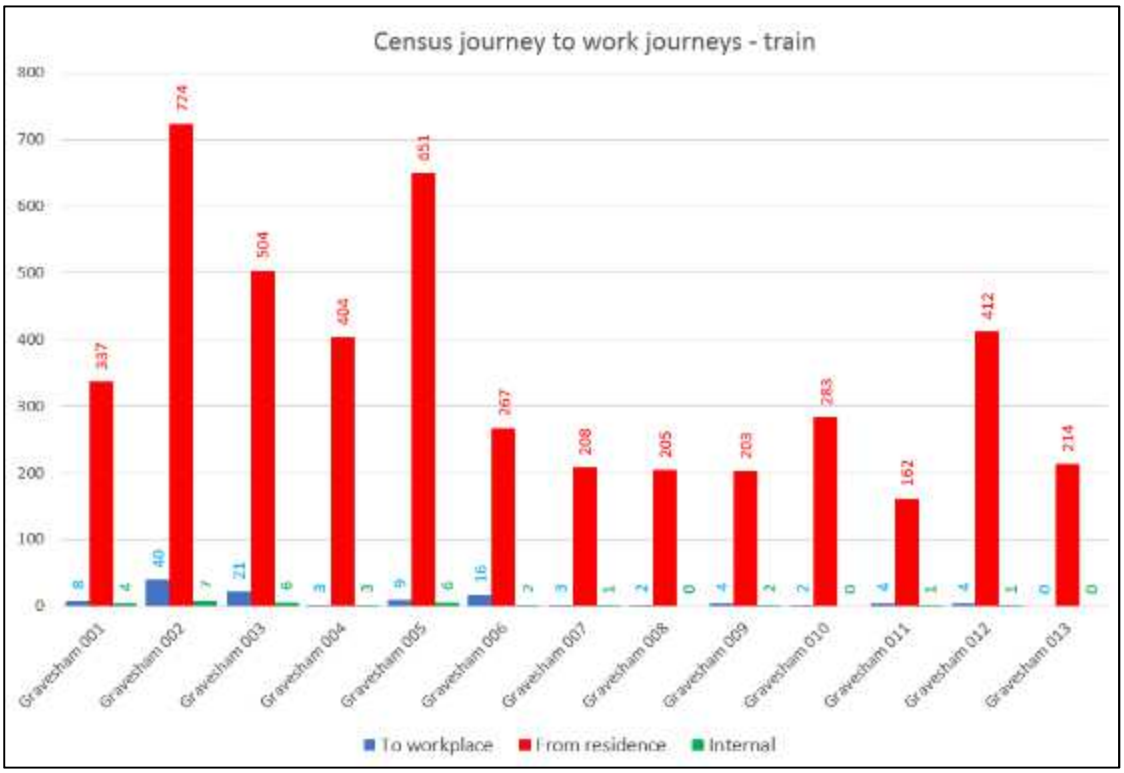


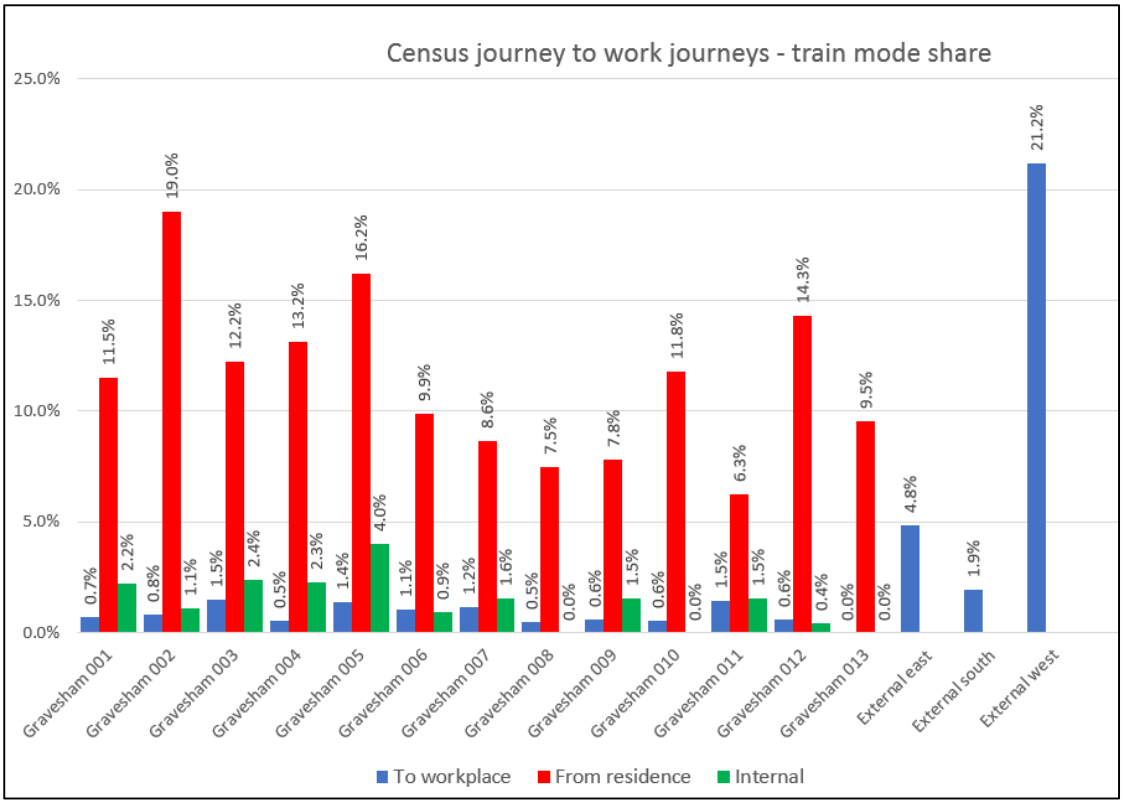


Train

6.8.4 The graphs below illustrates the rail trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst the middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.



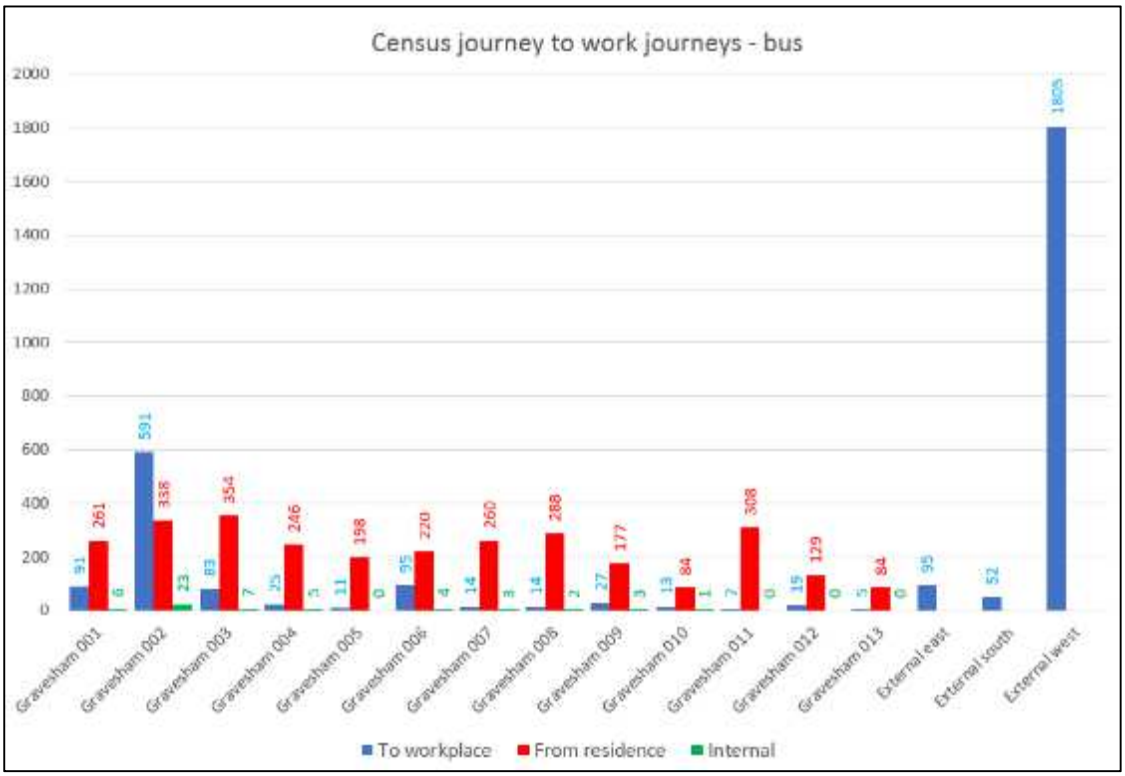


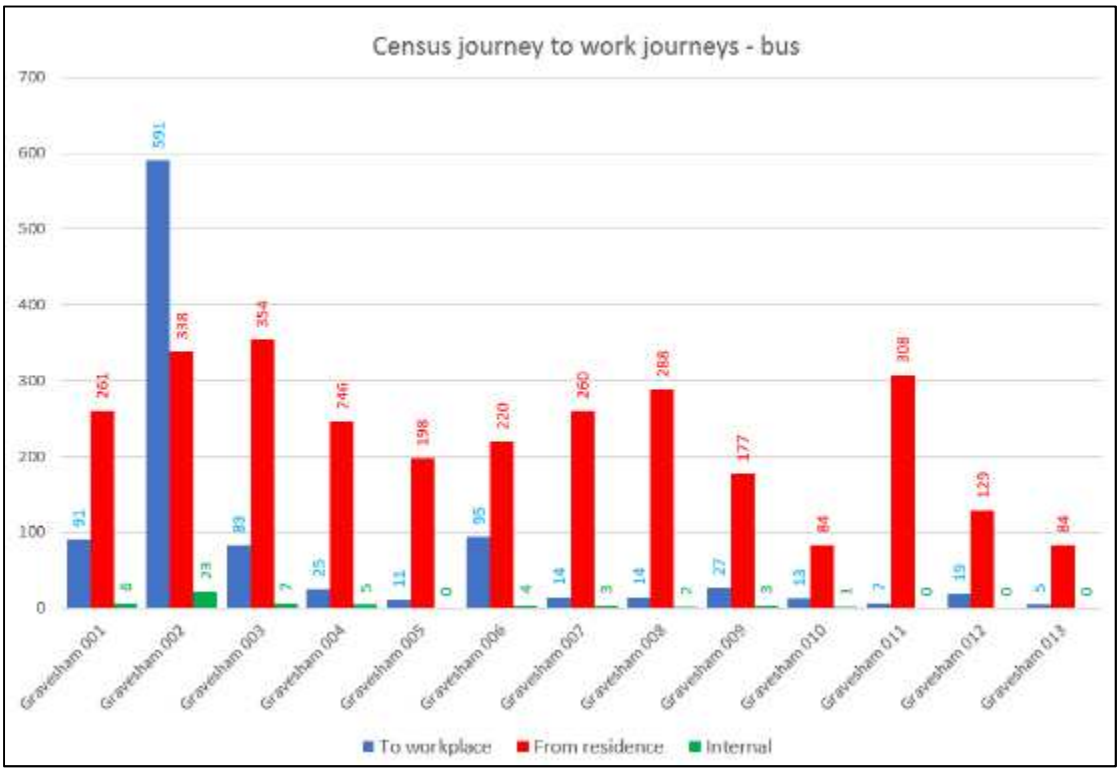


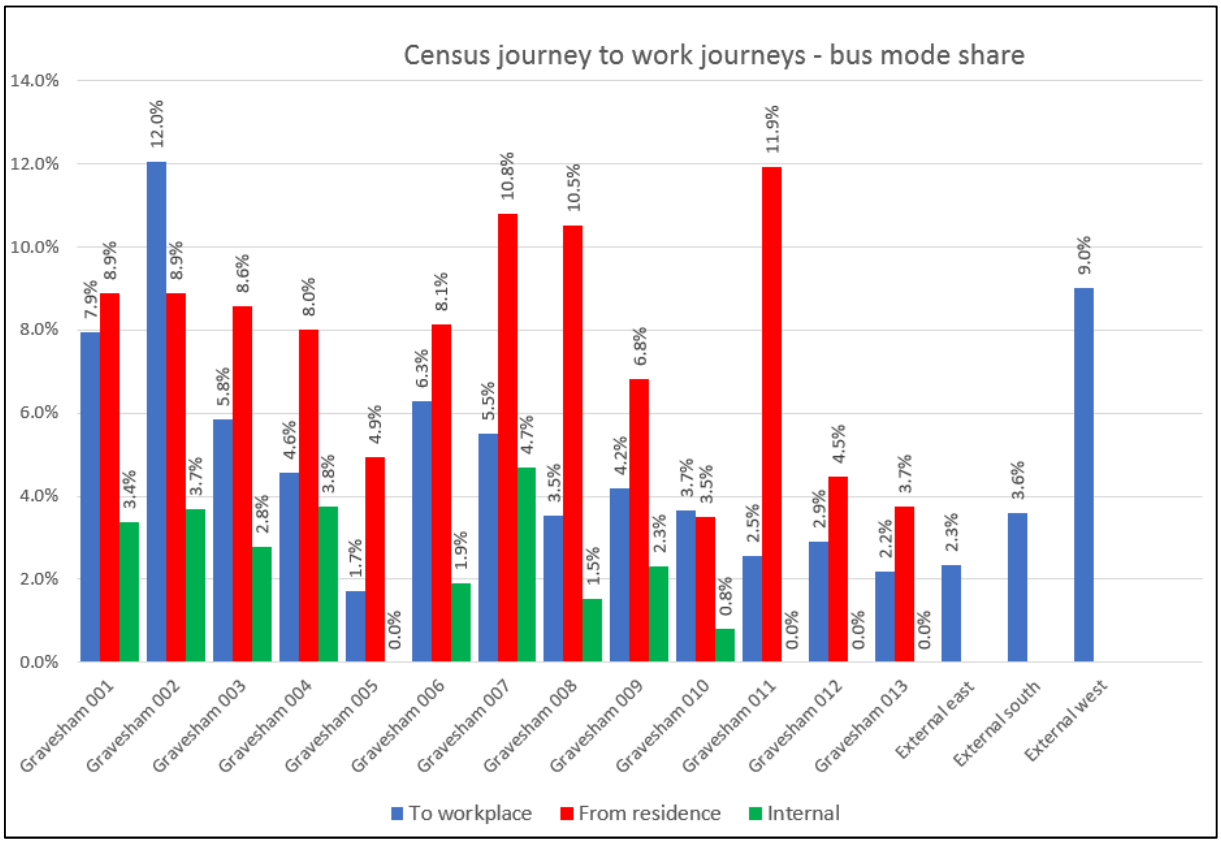
Bus

6.8.5 The graphs below illustrates the bus trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst the

middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.

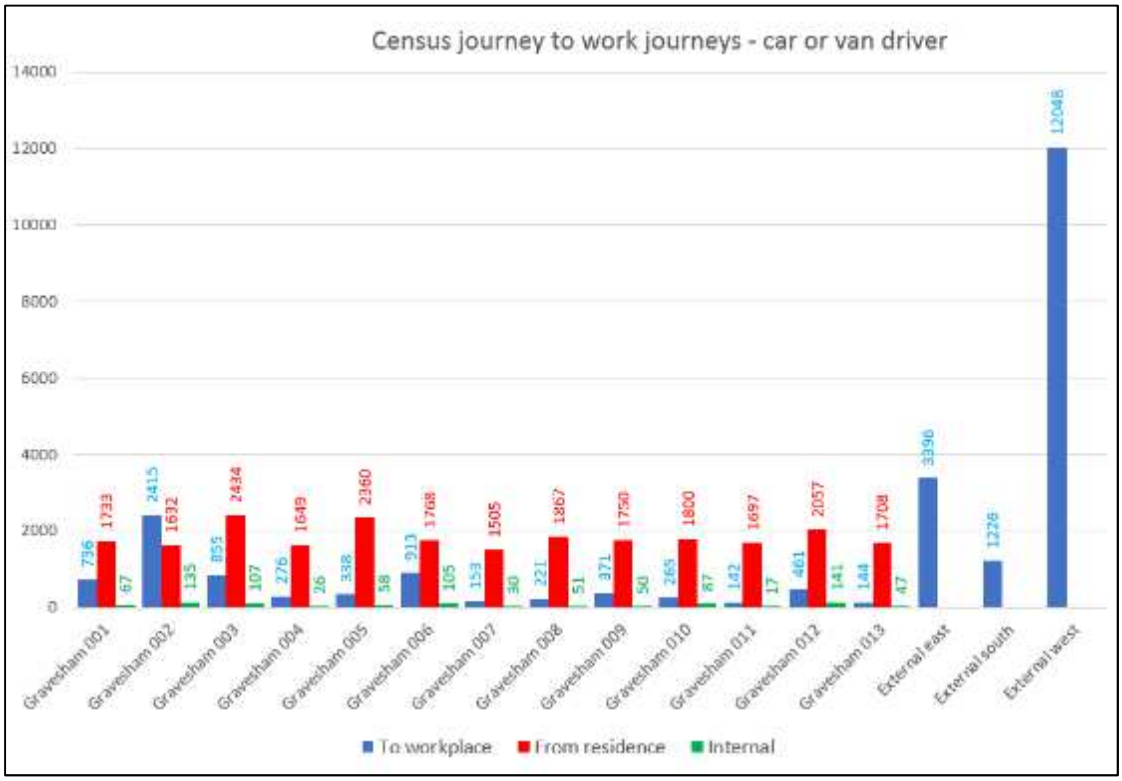


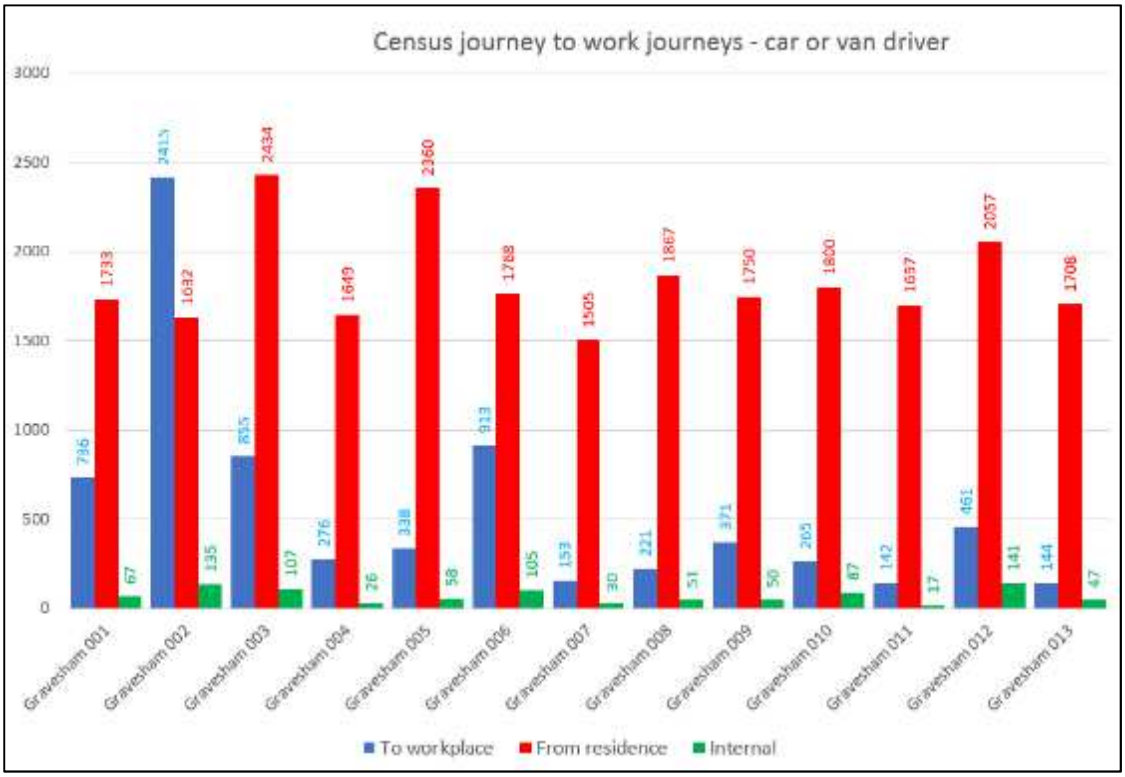


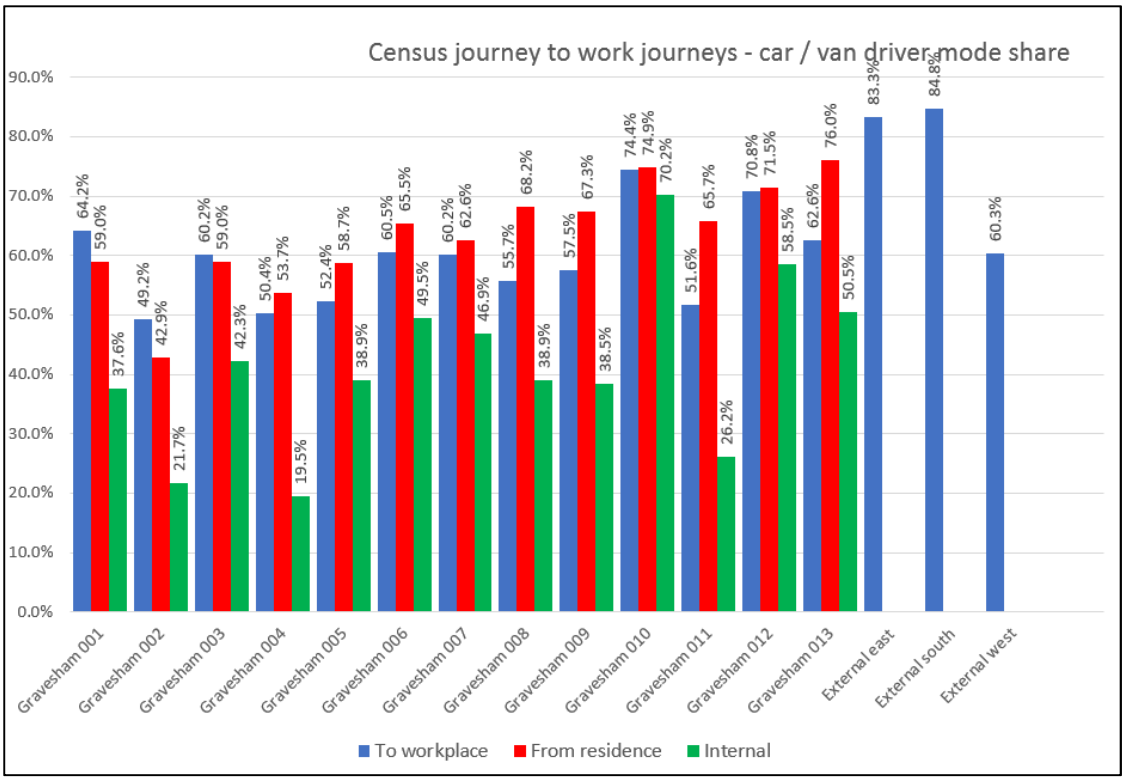


Car / Van driver

6.8.6 The graphs below illustrates the car / van driver trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst the middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.

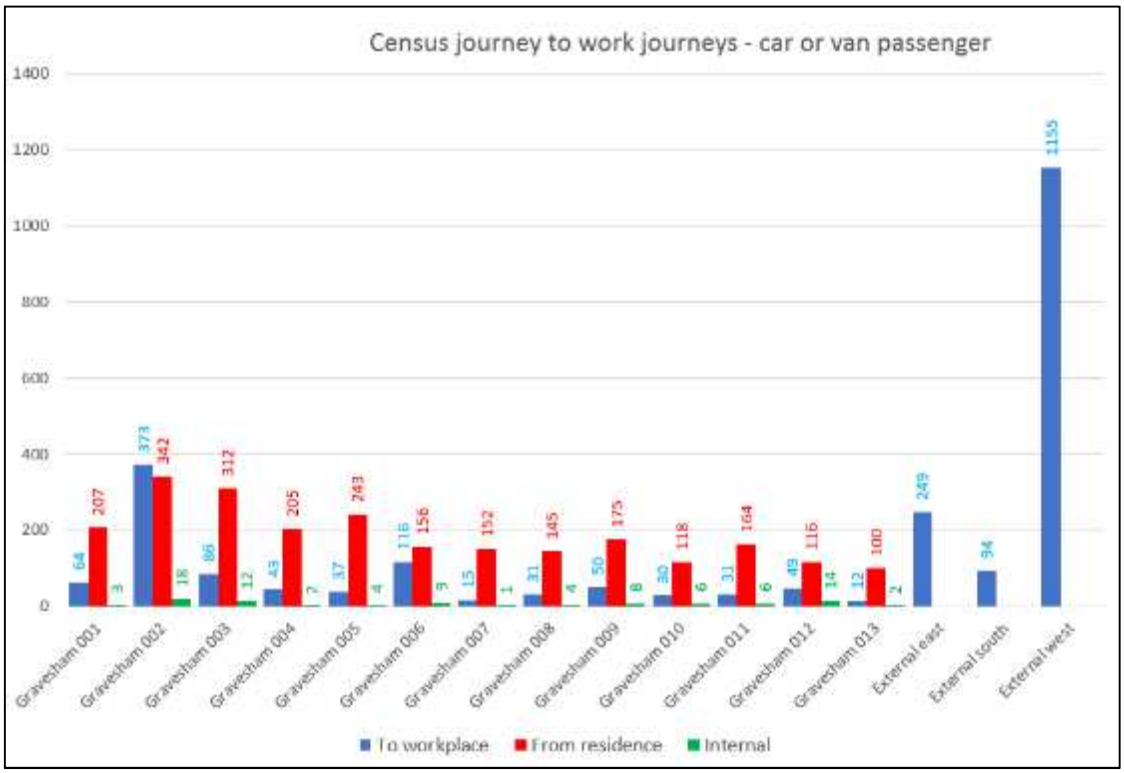


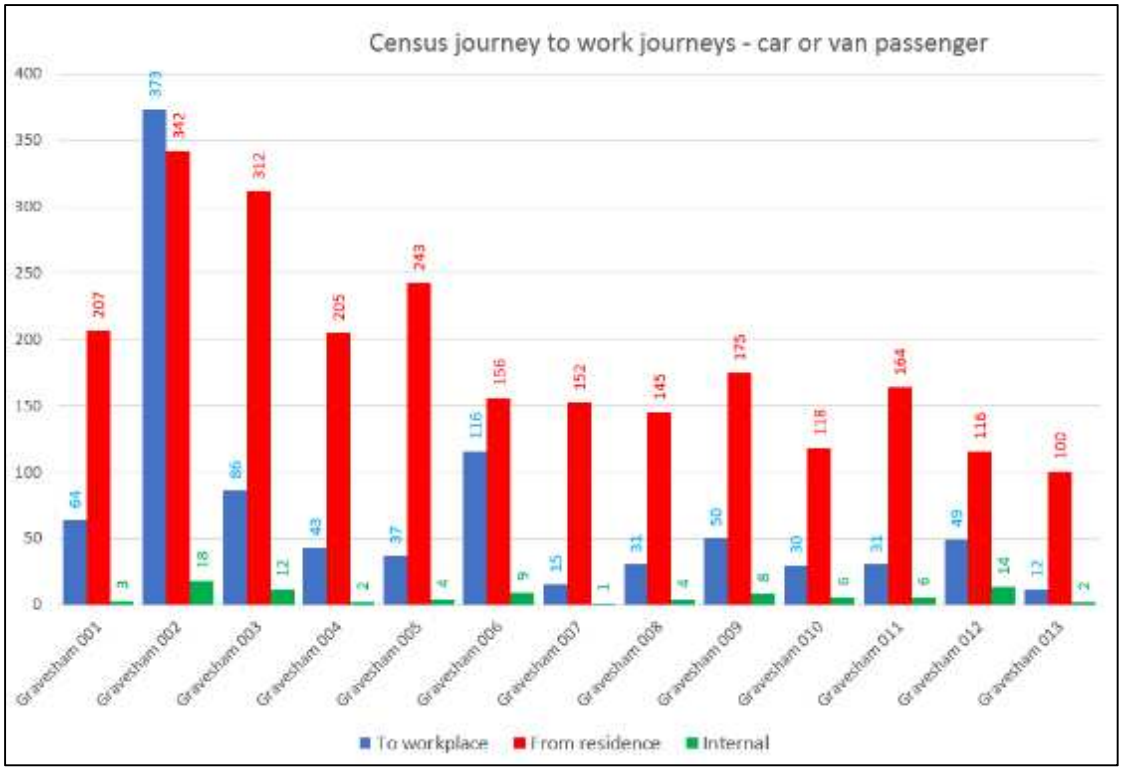


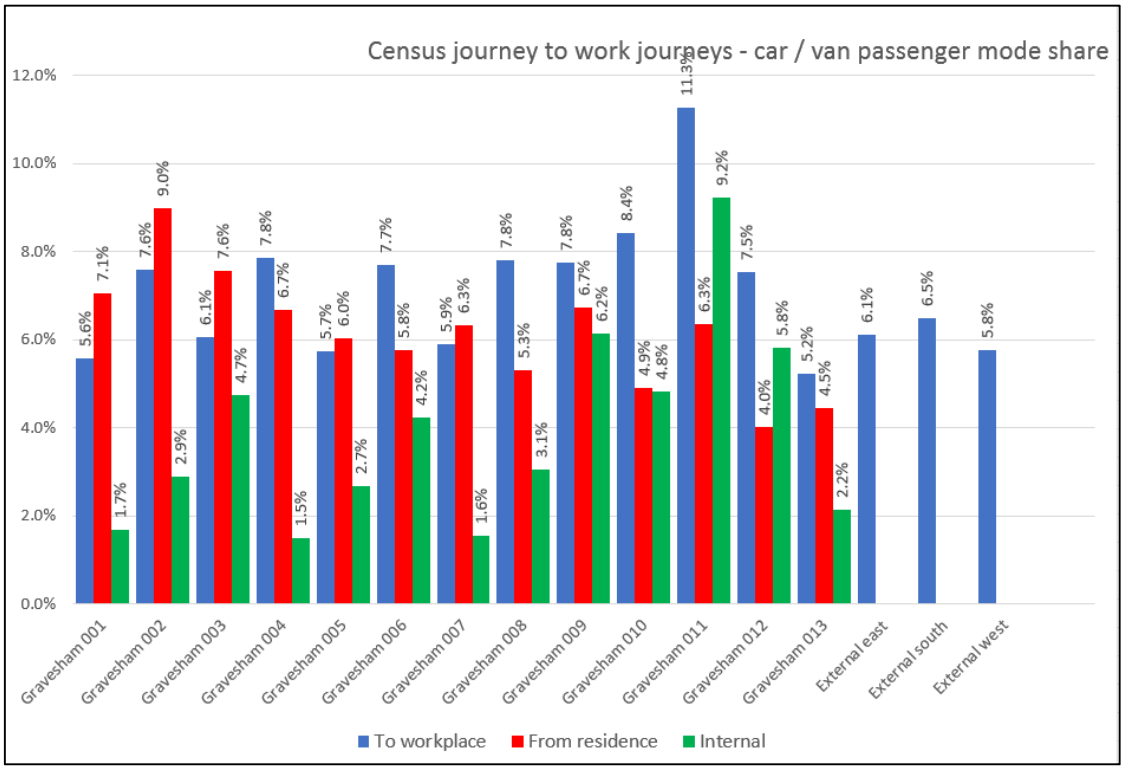


Car / Van passenger

6.8.7 The graphs below illustrates the car / van passenger trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst the middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.

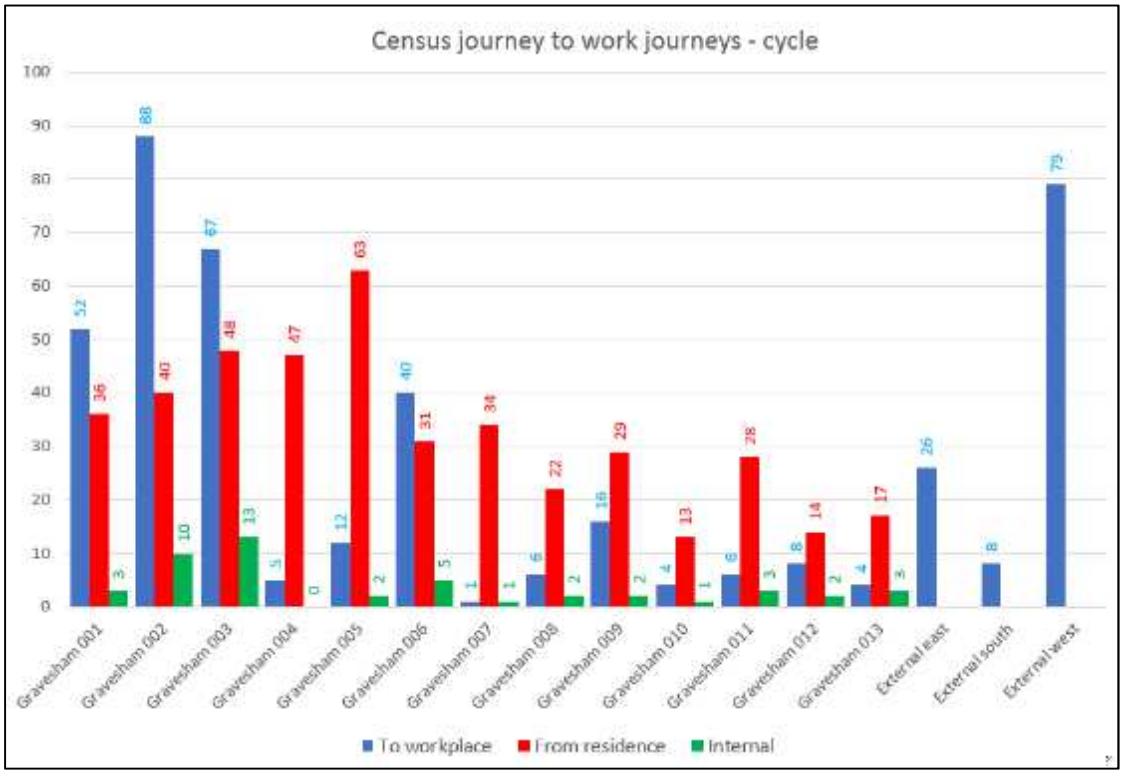

Census journey to work journeys - car or van passenger
1400
1200
1000
800
600
400
200
0
64
207
3
373
342
18
86
312
12
43
205
7
37
243
4
116
156
9
15
152
1
31
145
4
50
175
8
30
118
6
31
164
6
49
116
14
12
100
2
249
94
1155
Gravesham 001
Gravesham 002
Gravesham 003
Gravesham 004
Gravesham 005
Gravesham 006
Gravesham 007
Gravesham 008
Gravesham 009
Gravesham 010
Gravesham 011
Gravesham 012
Gravesham 013
External east
External south
External west
To workplace
From residence
Internal

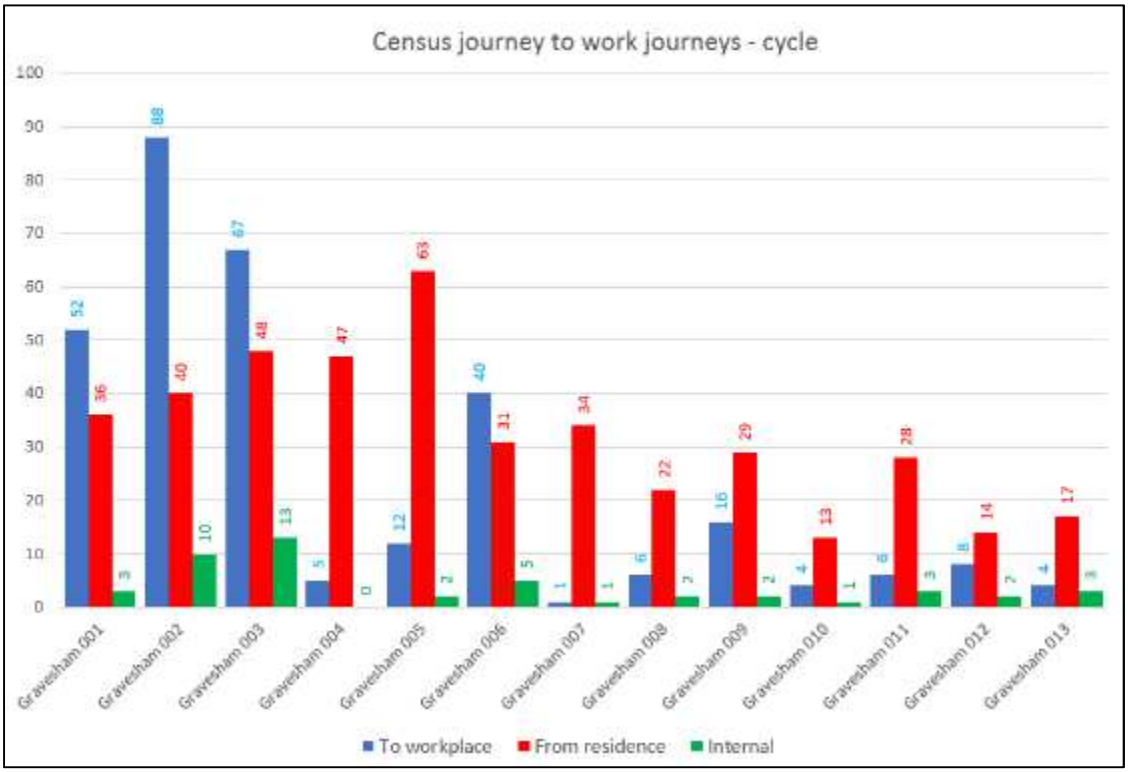

Census journey to work journeys - car or van passenger
400
350
300
250
200
150
100
50
0
64
207
3
373
342
18
86
312
12
43
205
2
37
243
4
116
156
9
15
152
1
31
145
4
50
175
8
30
118
6
31
164
6
49
116
14
12
100
2
Gravesham 001
Gravesham 002
Gravesham 003
Gravesham 004
Gravesham 005
Gravesham 006
Gravesham 007
Gravesham 008
Gravesham 009
Gravesham 010
Gravesham 011
Gravesham 012
Gravesham 013
To workplace
From residence
Internal

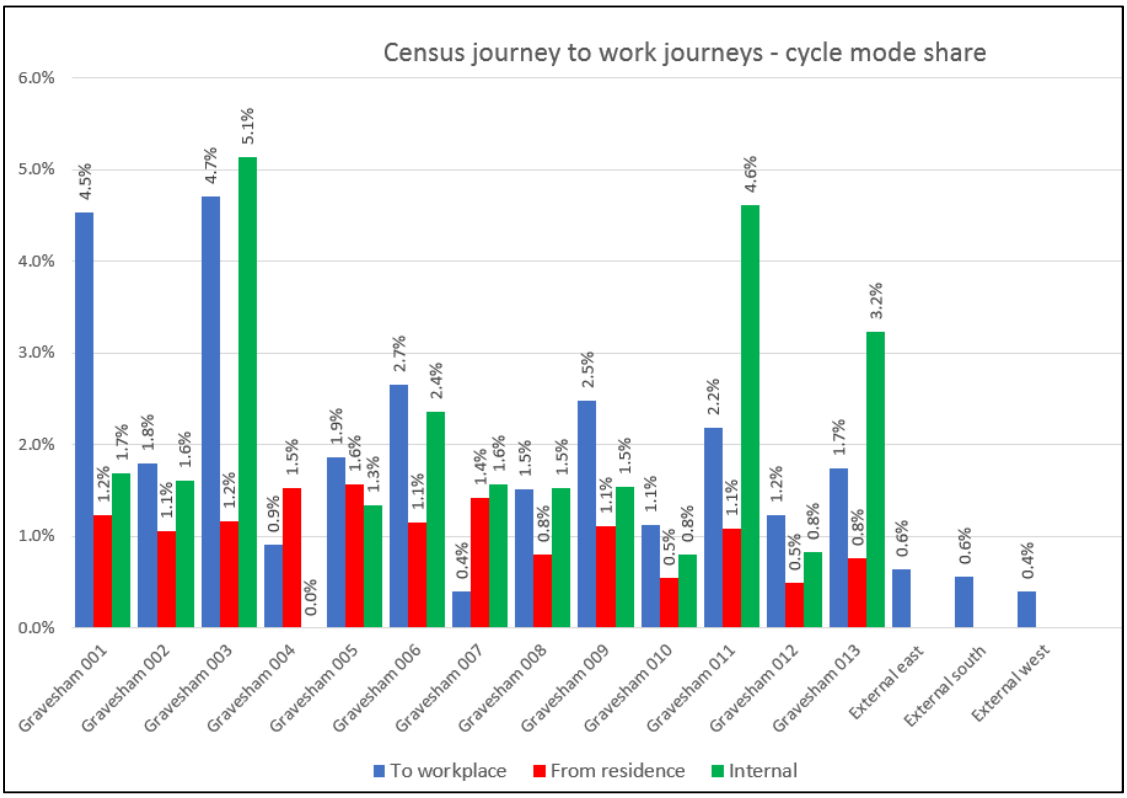


Cycle

6.8.8 The graphs below illustrates the cycle trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst the middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.



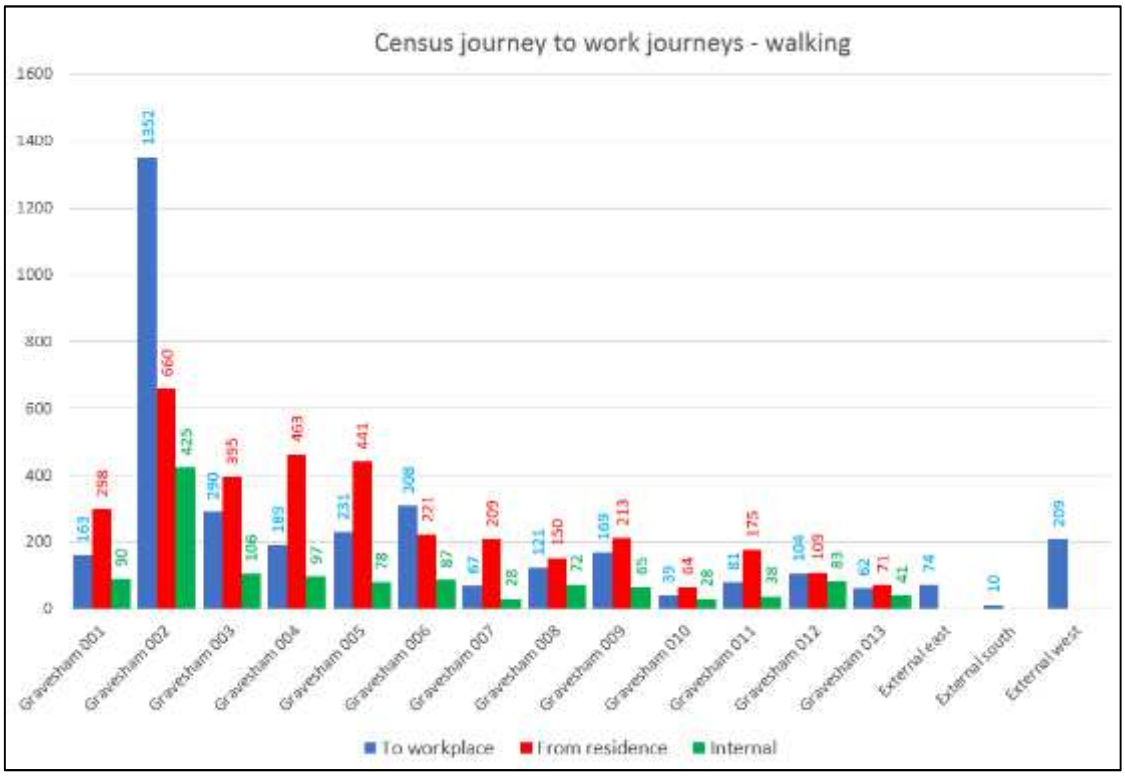


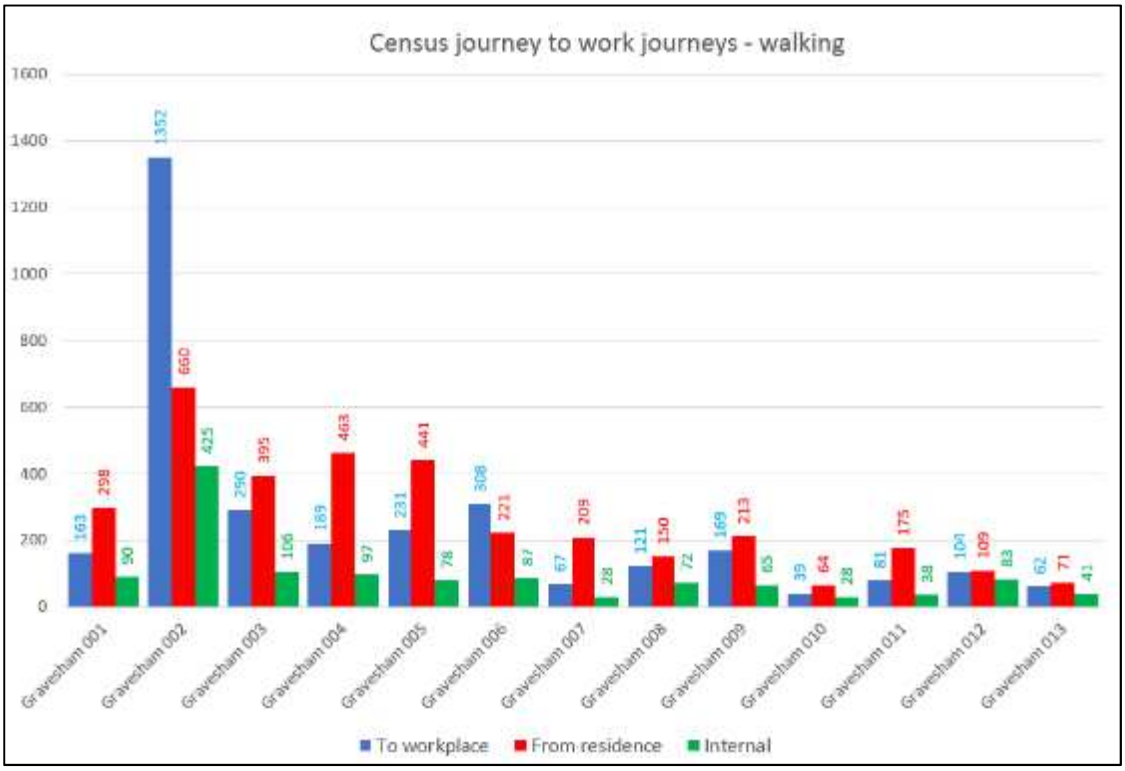


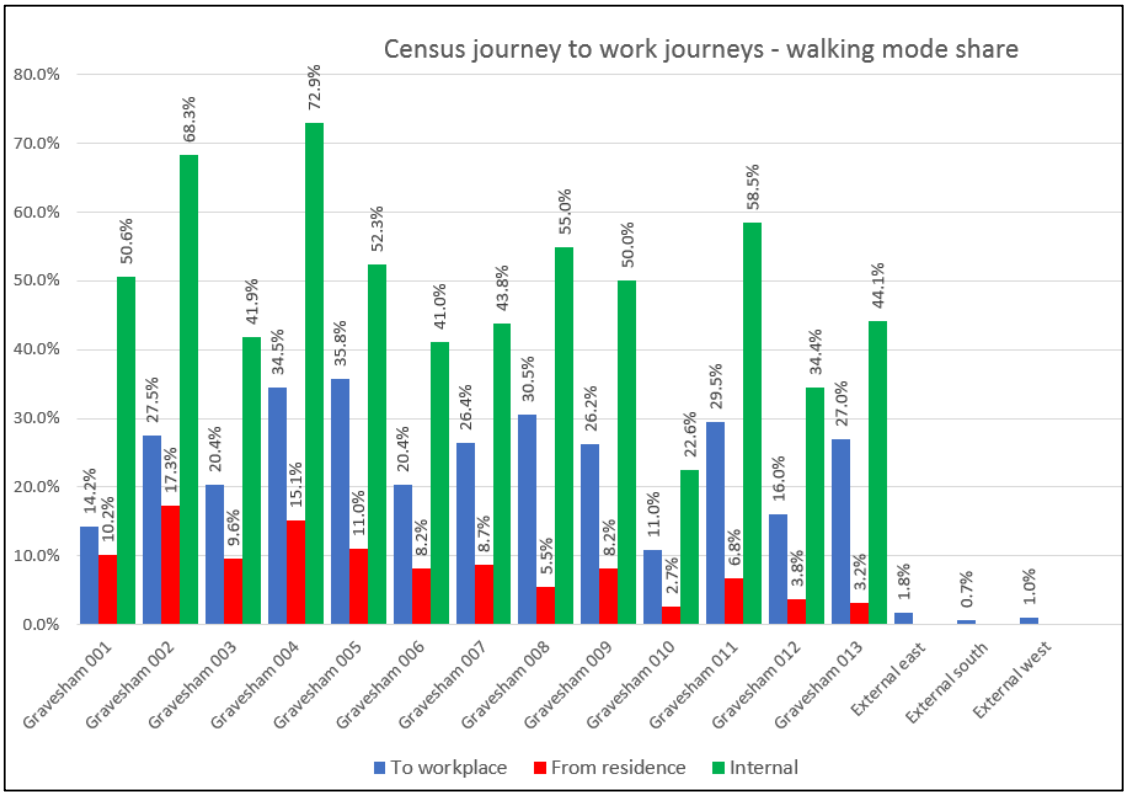
Walking

6.8.9 The graphs below illustrates the walking trips to and from each Gravesham MSOA. The top graph illustrates the graph with the census journey to work to external areas included, whilst

the middle graph excludes the external trips to remove the skewing effect of these. The bottom graph shows the mode share for each MSOA.






Census journey to work journeys - walking mode share
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
14.2%
10.2%
50.6%
27.5%
17.3%
68.3%
20.4%
9.6%
41.9%
34.5%
15.1%
72.9%
35.8%
11.0%
52.3%
20.4%
8.2%
41.0%
26.4%
8.7%
43.8%
30.5%
5.5%
55.0%
26.2%
8.2%
50.0%
11.0%
2.7%
22.6%
29.5%
6.8%
58.5%
16.0%
3.8%
34.4%
27.0%
3.2%
44.1%
1.8%
0.7%
1.0%
Gravesham 001
Gravesham 002
Gravesham 003
Gravesham 004
Gravesham 005
Gravesham 006
Gravesham 007
Gravesham 008
Gravesham 009
Gravesham 010
Gravesham 011
Gravesham 012
Gravesham 013
External east
External south
External west
To workplace
From residence
Internal

7 Baseline relative accessibility

7.1.1 This section reviews the high level relative accessibility of each of the identified settlements within this study. This provides an overview of the ranking of settlements with respect to transport access.

7.1.2 A relative comparison of each settlement has been made for each mode of travel based upon a set of weighting and scoring criteria described below.

7.2 Bus access – input data

7.2.1 To determine the relative bus accessibility of each settlement the following information has been extracted and used within the scoring process.

Access to a bus route within the settlement

7.2.2 The current availability of a bus route serving each settlement has been checked. If a bus route is currently provided to the settlement, then the settlement is considered to have bus connectivity and is given a bus accessibility score on the basis of the method described below.

7.2.3 As individual development sites come forward for promotion it will be important for each to demonstrate its accessibility to the bus network, both in terms of service patterns and bus stop proximity. At that stage it would be possible to review details of bus services through settlements and adjust, or add, bus stop locations and upgrade frequency.

Bus services serving or close to the settlement

7.2.4 The bus services that directly serve each settlement have been identified and information extracted for each. Bus services that are infrequent (for example, 2 buses on a Thursday or similar) or those that run on school days only, have been disregarded for the purposes of this accessibility exercise.

Number of weekday buses

7.2.5 For each bus service taken forward for scoring, the number of weekday buses (two way) passing through each settlement per day has been determined and input.

Evening buses

7.2.6 For each bus service taken forward for scoring, the number of weekday buses (two way) passing through each settlement after 19:00 has been determined and input.

Weekend and evening services

7.2.7 A check has been made with respect to whether each bus service taken forward for scoring offers a Saturday and / or Sunday service. The number of Saturday and Sunday buses are included within the scoring.

Rail station and town centre access

7.2.8 For each bus service taken forward for scoring, a check has been made as to whether it provides access to one of the stations within Gravesham Borough (Sole Street, Meopham, Gravesend, Higham or Northfleet) and / or Longfield, Wrotham & Borough Green or Ebbsfleet which are located external to Gravesham.

7.2.9 A further check has been made as to whether each of the bus services considered above provides direct access to Gravesend town centre.

7.2.10 The general bus travel time for each of the above destinations has been extracted and used within the scoring exercise.

7.3 Bus access – scoring criteria

7.3.1 The information above has been extracted for each settlement and utilised in the scoring process described below. The scoring methodology necessarily relies on a series of judgements and assumptions, but its purpose is not to provide an absolute number, but instead to provide a relative comparison of bus accessibility when comparing all of the settlements.

Bus service access score

7.3.2 A bus service access score has been calculated on the basis of summing the number of buses serving the settlement per weekday, per weekday evening and per weekend as described above.

Bus journey time weighting

7.3.3 Bus connectivity between each settlement and to the rail stations and Gravesend town centre have been scored. It has been assumed that a bus journey time of 5 minutes to 30 minutes will attract a score. It is considered unlikely that the significant majority of passengers will travel by bus for a shorter or longer period of time than this to access a rail station or the town centre.

7.3.4 Therefore, a bus journey time weighting has been derived for journeys between 5 and 30 minutes with a maximum weighting of 1.0 available for journeys of 5 minutes and a weighting of 0.0 given for 30 minutes.

7.3.5 A decreasing linear relationship between journey time and weighting has been assumed for the bus journey time weighting between 5 minutes and 30 minutes.

Rail station and Gravesend bus access score

7.3.6 A rail station bus access score has been calculated on the basis of the number of daily buses (one way) connecting a settlement with a particular rail station, multiplied by the bus journey time weighting described above.

7.3.7 This has been repeated for each of the rail stations considered and for each settlement. A total score for each settlement is derived by combining the individual rail station scores for that settlement.

7.3.8 A similar exercise has been completed to achieve a score for bus access to Gravesend town centre from each settlement.

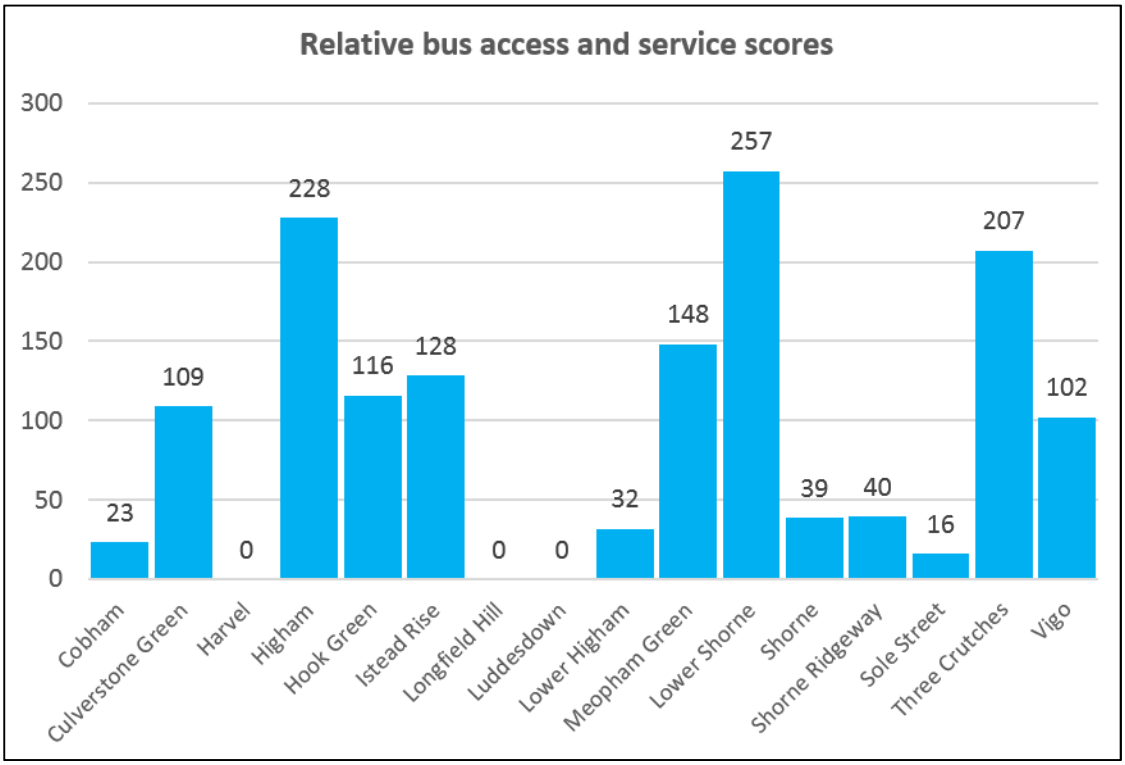
Total bus accessibility score

7.3.9 The total bus accessibility score for each settlement is achieved by combining the bus service access score, the rail station bus access score and Gravesend bus access score as described above.

7.4 Bus accessibility score

7.4.1 The purpose of the scoring exercise described above is to be able to rank the settlements with respect to their high level bus accessibility and hence provide a relative comparison between each.

7.4.2 Based upon the scoring methodology described above, the graph and table below summarise the scores and rankings for the group of settlements assessed whilst Appendix M1 contains further details.



Rank	Settlement	Score
1	Lower Shorne	257
2	Higham	228
3	Three Crutches	207
4	Meopham Green	148
5	Istead Rise	128
6	Hook Green	116
7	Culverstone Green	109
8	Vigo	102
9	Shorne Ridgeway	40
10	Shorne	39
11	Lower Higham	32
12	Cobham	23

13	Sole Street	16
14	Luddesdown	0
15	Longfield Hill	0
16	Harvel	0

7.5 Rail access – input data

7.5.1 To determine the relative rail accessibility of each settlement (by walking, cycling or bus) the following information was extracted and used within a scoring process.

Walk and cycle access to the rail network

7.5.2 With respect to walk distance to rail stations a check has been made for each rail station as to whether it lies within a distance range of an approximately 20 minute walk (1600m) from each settlement under consideration.

7.5.3 This is consistent with research conducted by WYG and presented in 2015 in a paper called “How far do people walk” which is based upon National Travel Survey data. The WYG paper concluded that people would walk up to 1610m to a rail station from new developments.

7.5.4 A further check was made to establish whether a pedestrian footway is available from each settlement under consideration to each station that lies within the distance range above.

7.5.5 Whilst other factors would come into consideration when determining the attractiveness of walking to a destination, these would need to be considered in further detail as particular sites come forward for promotion.

Cycle access to the rail network

7.5.6 With respect to cycle distance to rail stations a check has been made for each rail station as to whether it lies within a distance range of an approximately 20 minute cycle (6700m at an assumed speed of 20kph).

7.5.7 This distance compares with the CIHT document “Planning for cycling” published in October 2014 that states that 80% of cycling trips are less than 5 miles (8000m).

7.5.8 A further check was made to establish whether a reasonable cycle route is available from each settlement under consideration to each station that lies within the distance range above.

7.5.9 If a cycle route could be demonstrated that generally follows carriageways subject to a 30mph / 40mph speed restriction and are delineated by a centre line, then this has been considered reasonable as a cycle route for the purpose of this exercise.

7.5.10 Whilst other factors would come into consideration when determining the attractiveness of cycling to a destination, these would need to be considered in further detail as particular sites come forward for promotion.

Bus access to the rail network

7.5.11 A check has been made as to whether each station is accessible by bus from each settlement, and if so, how long is the journey time. This information has been carried across from the bus accessibility exercise described above.

7.6 Rail access – scoring criteria

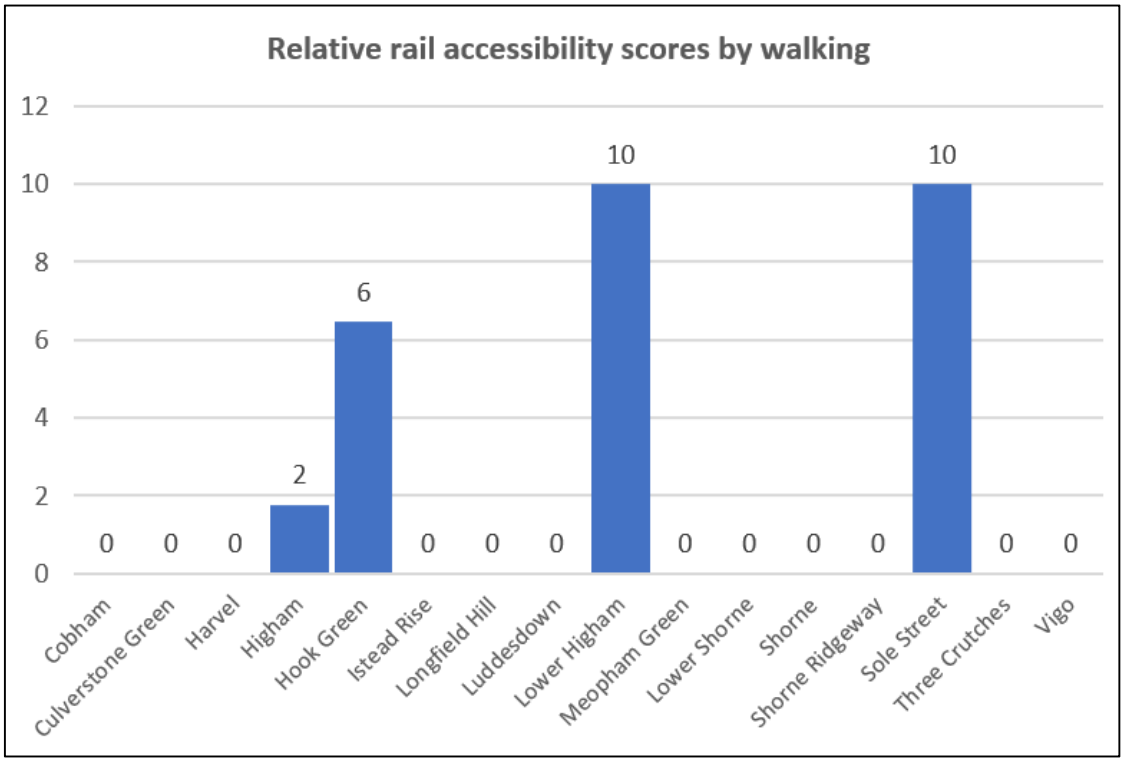
7.6.1 The information above has been extracted for each settlement and utilised in the scoring process described below. The scoring methodology necessarily relies on a series of judgements and assumptions, but its purpose is not to provide an absolute number, but instead to provide a relative comparison of rail accessibility when comparing all of the settlements.

Walk access score

7.6.2 The walk access to the rail network serving the settlements has been scored relative to the distance between each of the stations considered and each settlement.

7.6.3 A walk access score has been calculated for each settlement on a scale of 1 to 10. The distance range over which a walk access score has been calculated has been selected as 0m (which scores 10) to 1,600m (which scores 0) assuming a maximum of a 20 minute walk. A linear scale has been assumed to derive a walk access score.

7.6.4 Based upon the above, the graph below illustrates the walk access score to the rail network.

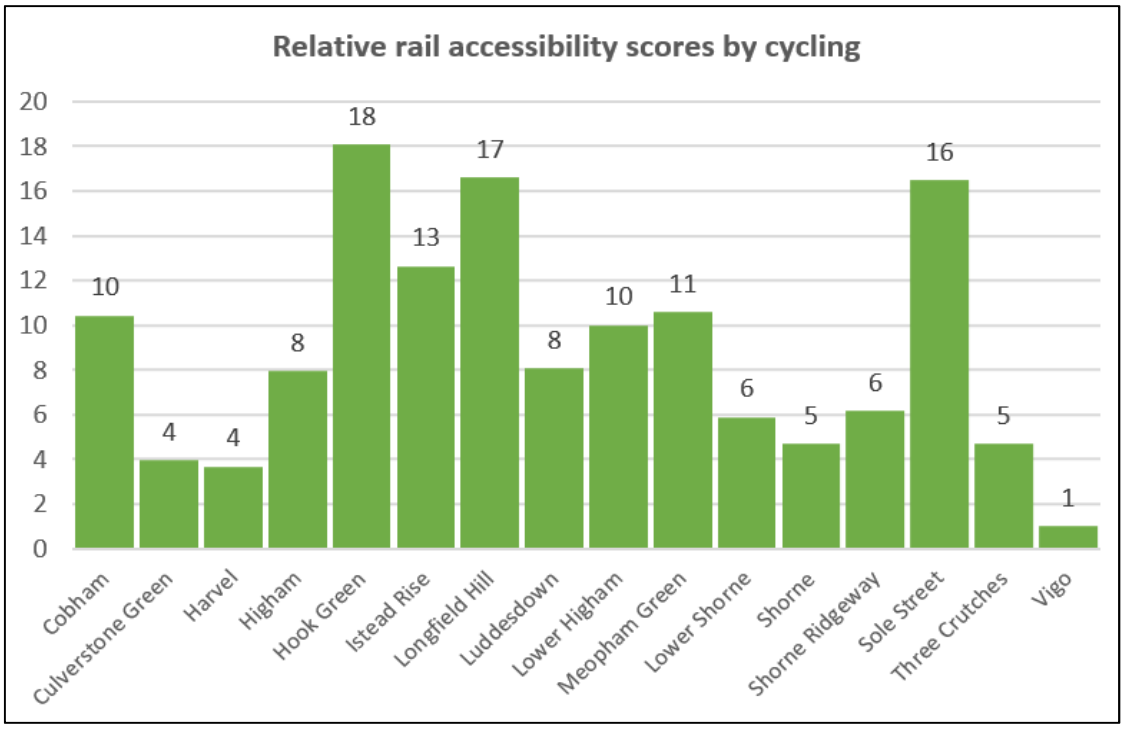


Cycle access score

7.6.5 The cycle access to the rail network serving the settlements has been scored relative to the distance between each of the stations considered and each settlement.

7.6.6 A cycle access score has been calculated for each settlement on a scale of 1 to 10. The distance range over which a cycle access score has been calculated has been selected as 0m (which scores 10) to 6,700m (which scores 0) assuming a maximum of a 20 minute cycle (at 20kph). A linear scale has been assumed to derive a cycle access score.

7.6.7 Based upon the above, the graph below illustrates the walk access score to the rail network.

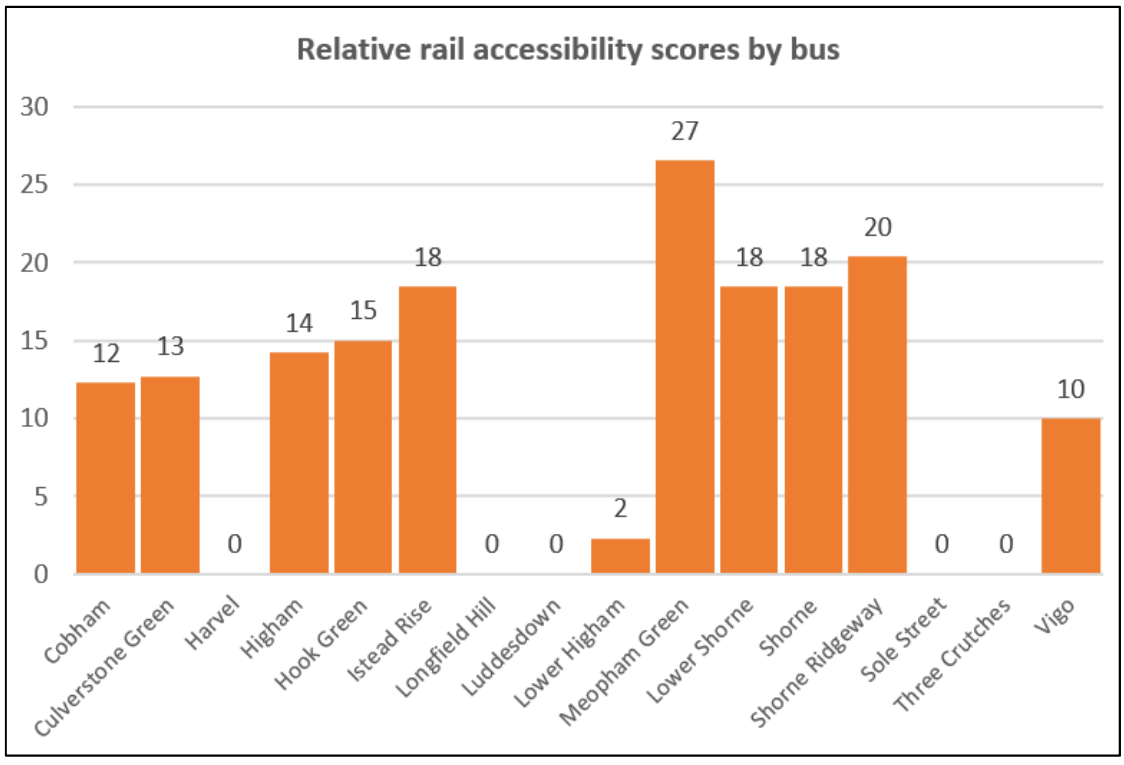


Bus access score

7.6.8 A rail station bus access score has been calculated on the basis of the number of daily buses (one way) connecting a settlement with a particular rail station, multiplied by the bus journey time weighting described above.

7.6.9 This has been repeated for each of the rail stations considered and for each settlement. A total score for each settlement is derived by combining the individual rail station scores for that settlement.

7.6.10 Based upon the above, the graph below illustrates the bus access score to the rail network.



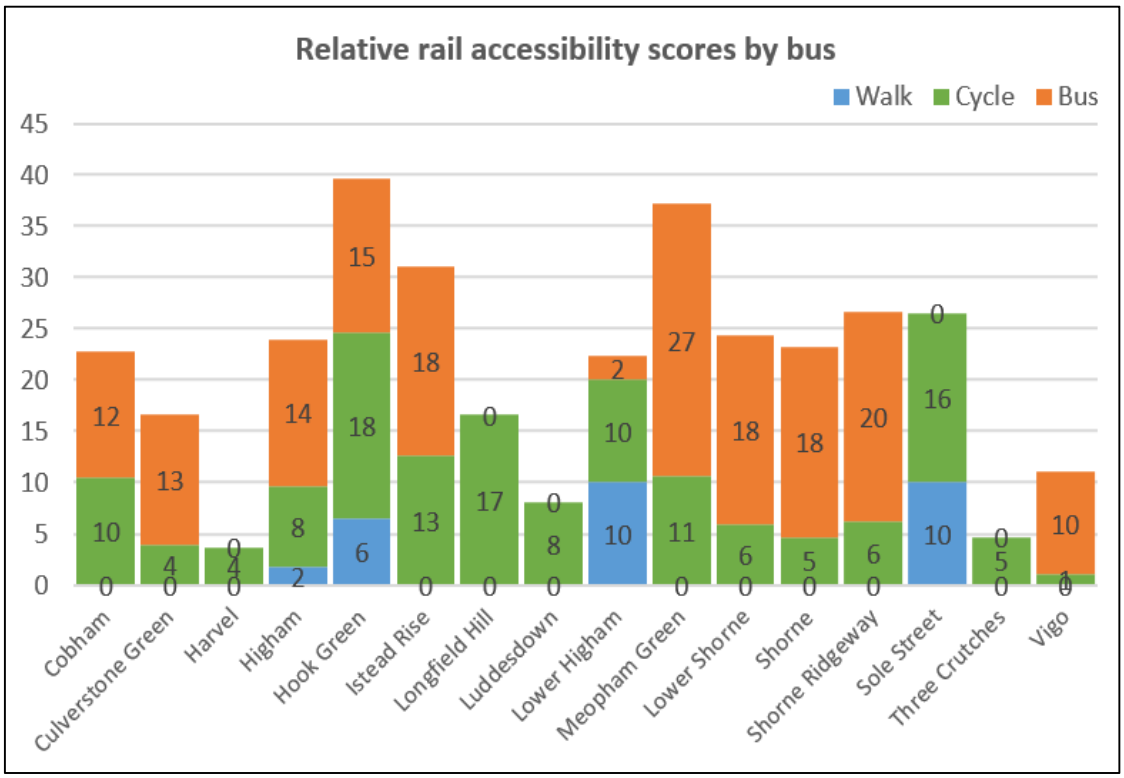
Total rail accessibility score

7.6.11 A combined rail accessibility score for each settlement is achieved by combining the scores for each of the mode scores described above.

7.7 Rail accessibility score

7.7.1 The purpose of the scoring exercise described above is to be able to rank the settlements with respect to their accessibility to rail services and hence provide a relative comparison between each.

7.7.2 Based upon the scoring methodology described above, the graph and table below summarise the scores and rankings for the group of settlements assessed whilst Appendix M1 contains further details.



Rank	Settlement	Score
1	Hook Green	40
2	Meopham Green	37
3	Istead Rise	31
4	Shorne Ridgeway	27
5	Sole Street	26
6	Lower Shorne	24
7	Higham	24
8	Shorne	23
9	Cobham	23

10	Lower Higham	22
11	Culverstone Green	17
12	Longfield Hill	17
13	Vigo	11
14	Luddesdown	8
15	Three Crutches	5
16	Harvel	4

7.8 Walking and cycling access

7.8.1 Consideration has been given to the ability of residents within each settlement to meet a proportion of their daily needs through walking and cycling journeys.

Amenity "need" weighting

7.8.2 For the purposes of this study the amenities have been further considered on the basis of whether they meet what might be considered a typical day to day need or more of an occasional need. The table below summarises the assumptions made.

Amenity	Meets a day to day need ?	Meets a more occasional need ?
Primary education	YES	
Secondary education	YES	
Community space / hall		YES
Public house		YES
Convenience / Food store	YES	
Other retail		YES
Post office	YES	
Place of worship		YES
Recreation ground		YES
Leisure		YES
Restaurant		YES
Café / Coffee shop		YES
Takeaway		YES
Health centre / GP	YES	
Pharmacy	YES	
Vet		YES
Services		YES
Garage / car sales / car maintenance		YES
Other		YES

7.8.3 An amenity "need" weighting of 2 has been given to the day to day need amenities and a weighting of 1 has been given to the more occasional need amenities.

Amenity score

7.8.4 An amenity score has been calculated for each settlement based upon the weighting assumptions above and the number of each amenity category included within each settlement.

7.8.5 The amenities within each settlement have been determined through reference to GBC paper "Gravesham Settlement Hierarchy Technical Paper 2017".

7.8.6 The table below summarises the amenity score derived for each settlement whilst the score details can be found in Appendix M1.

Rank	Settlement	Score
1	Hook Green	48
2	Meopham Green	40
3	Higham	30
4	Istead Rise	26
5	Vigo	19
6	Cobham	14
7	Shorne	12
8	Culverstone Green	11
9	Luddesdown	5
10	Harvel	5
11	Sole Street	4
12	Lower Higham	3
13	Shorne Ridgeway	2
14	Three Crutches	1
15	Longfield Hill	1
16	Lower Shorne	0

Walking and cycling access

7.8.7 Further consideration has been given as to whether the amenities identified above are generally accessible from within the settlement by walking and / or cycling journeys.

7.8.8 Hence, a review of whether footways are typically present within the settlement to facilitate pedestrian journeys to each amenity is completed.

7.8.9 Similarly, for cycling, a review of whether cycle journeys can generally be conducted to each amenity on routes of 30mph / 40mph and where the carriageway is wide enough to be demarked by a centreline.

7.8.10 Where the answer to the above is YES, then the amenity score for each amenity category is added together to derive a walking and a cycling score. The table below summarises the scores achieved whilst the details are included at Appendix M1.

Rank	Settlement	Score
1	Hook Green	96
2	Meopham Green	80
3	Higham	60
4	Istead Rise	52
5	Vigo	34
6	Culverstone Green	22
7	Shorne	19
8	Cobham	18
9	Sole Street	8
10	Lower Higham	6
11	Shorne Ridgeway	2
12	Longfield Hill	2
13	Three Crutches	0
14	Lower Shorne	0
15	Luddesdown	0
16	Harvel	0

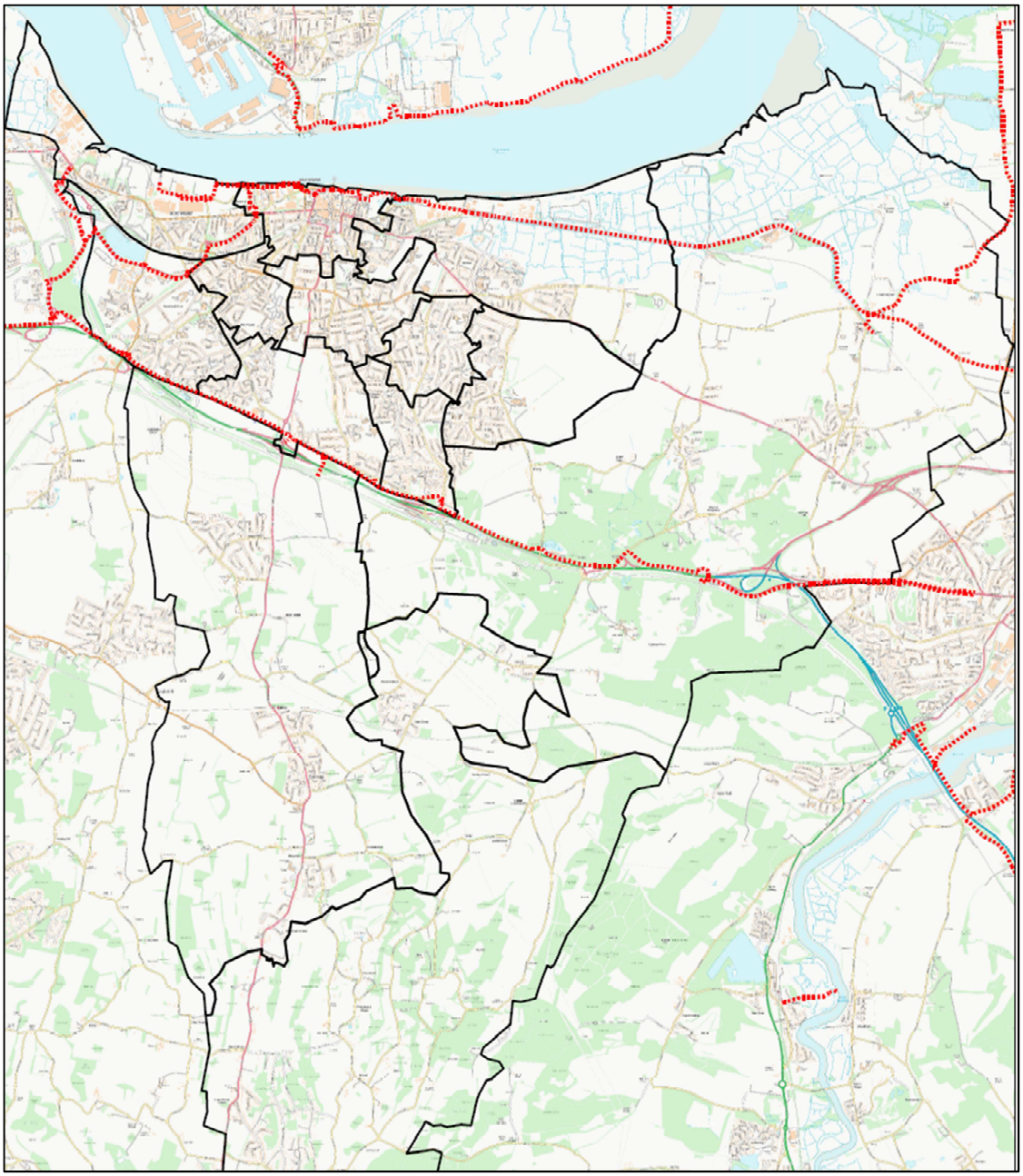
7.8.11 The purpose of the scoring exercise described above is to be able to rank the settlements with respect to being able to meet day to day and occasional needs through walking and cycle journeys.

Surrounding cycle network

7.8.12 With respect to the cycle network beyond each settlement the figure below illustrates the national cycle network routes based upon information provided by GBC.

7.8.13 The national cycle route 1 is a long distance cycle route connecting Dover and the Shetland Islands via the east coast of England and Scotland. Within Gravesham it passes along the A226.

7.8.14 The national cycle route 177 runs parallel to the A2 within Gravesham heading east from Ebbsfleet junction.



7.9 Highway access

7.9.1 To determine the relative highway accessibility of each settlement the following information was extracted and used within the scoring process.

Input data

7.9.2 A review of the highway network has been undertaken in terms of its proximity to each settlement with respect to the A2 and M20, the next nearest A class road, and the closest B class road.

Scoring criteria

7.9.3 A score has been assigned to each settlement related to its distance to the A2 and M20, A and B road networks.

7.9.4 A maximum score of 100 is applied for settlements for each of the road categories above passing through them. A score of 0 is applied for each of the above road categories that are further than 10,000m away. An inverse square relationship score between 100 and 0 has been applied for the distances between 0m and 10,000m.

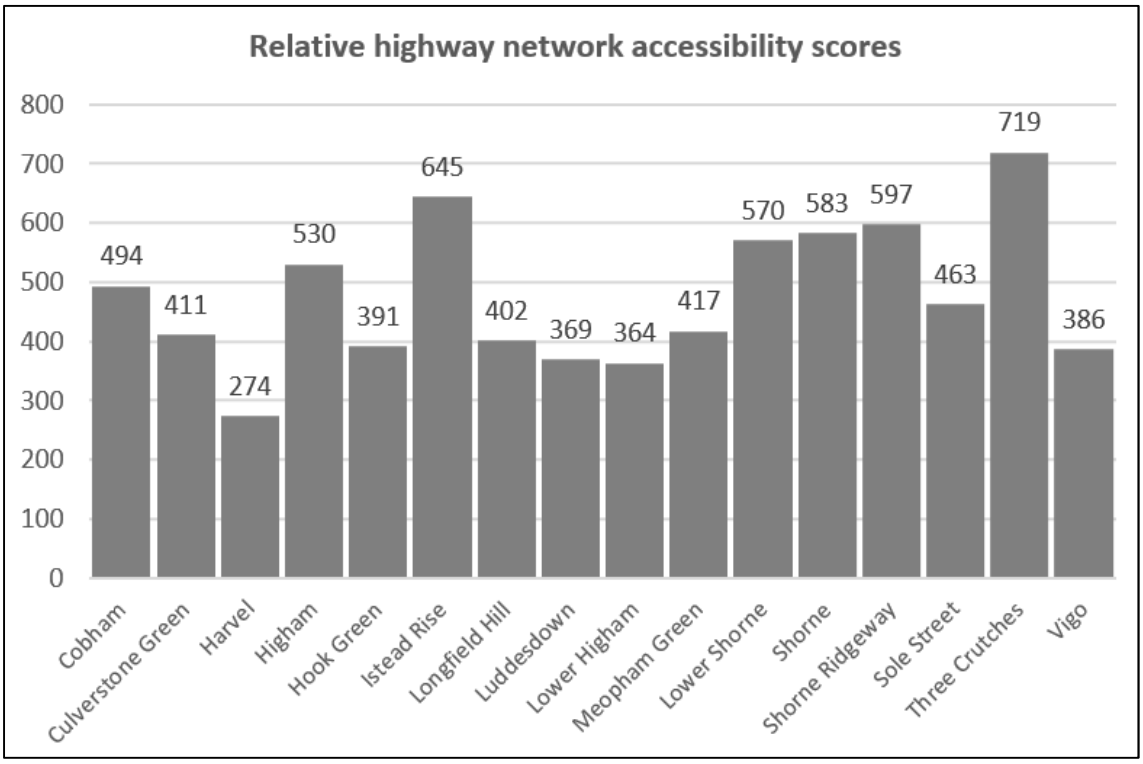
7.9.5 The scores have been weighted such that access to a B road is weighted by 1.0, an A road score is weighted by 2.5 and the A2 and M20 score is weighted by 5.0. This weighting recognises the relative importance of access to the different road categories.

Accessibility score

7.9.6 The highway accessibility score for each settlement is achieved by combining the scores for the road categories as described above.

7.9.7 The purpose of the scoring exercise described above is to be able to rank the settlements with respect to their highway accessibility.

7.9.8 Based upon the scoring methodology described above, the graph and table below summarise the scores and rankings for the group of settlements assessed whilst Appendix M1 contains further details.



Rank	Settlement	Score
1	Three Crutches	719
2	Istead Rise	645
3	Shorne Ridgeway	597
4	Shorne	583
5	Lower Shorne	570
6	Higham	530

7	Cobham	494
8	Sole Street	463
9	Meopham Green	417
10	Culverstone Green	411
11	Longfield Hill	402
12	Hook Green	391
13	Vigo	386
14	Luddesdown	369
15	Lower Higham	364
16	Harvel	274

7.10 Summary

7.10.1 The table below summarises the rankings for each settlement (ordered alphabetically) based upon the criteria and scores above and for each mode considered. The colours indicate the following :

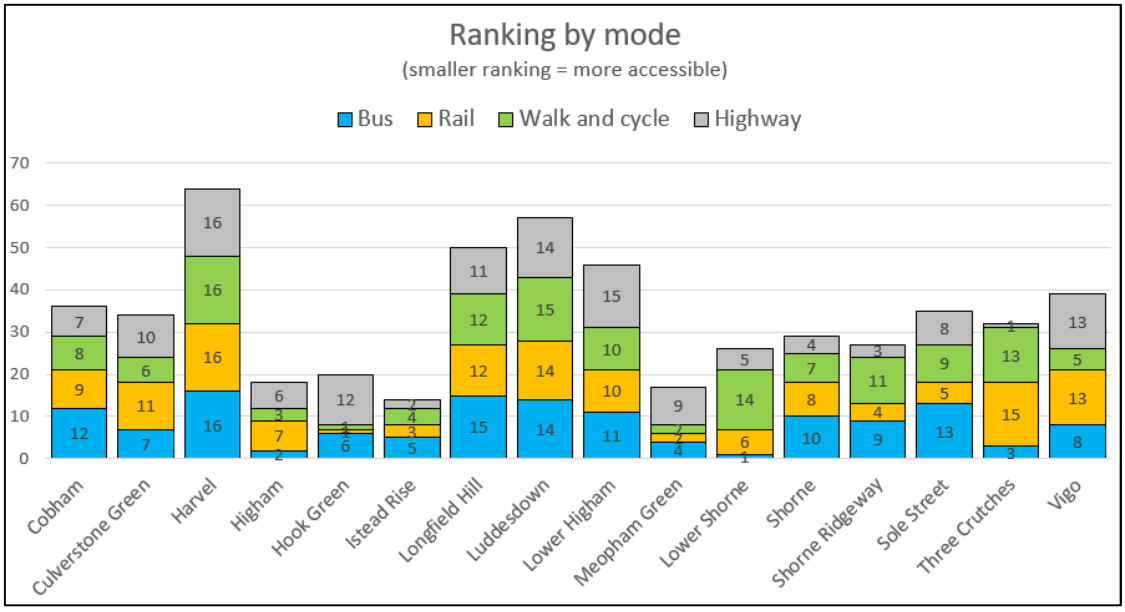
- Green The settlement ranks in the top 4 for that mode
- Yellow The settlement ranks between 5th and 8th for that mode.
- Orange The settlement ranks between 9th and 12th for that mode.
- Red The settlement ranks between 13th and 16th for that mode.

Settlement	Bus	Rail	Walk / cycle	Highway
Cobham	12	9	8	7
Culverstone Green	7	11	6	10
Harvel	16	16	16	16
Higham	2	7	3	6
Hook Green	6	1	1	12
Istead Rise	5	3	4	2
Longfield Hill	15	12	12	11
Luddesdown	14	14	15	14
Lower Higham	11	10	10	15
Meopham Green	4	2	2	9
Lower Shorne	1	6	14	5
Shorne	10	8	7	4
Shorne Ridgeway	9	4	11	3
Sole Street	13	5	9	8
Three Crutches	3	15	13	1
Vigo	8	13	5	13

7.10.2 The above table has been re-arranged in ascending order such that the settlement that scores lowest (when rankings for all modes are added together) appears at the top.

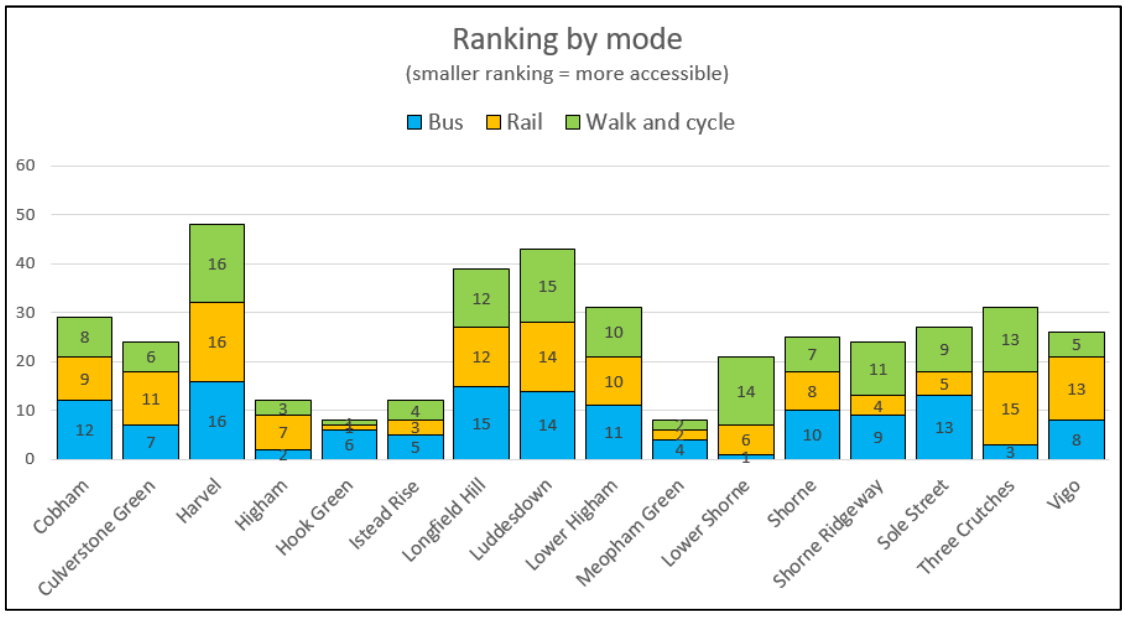
7.10.3 On this basis, the table and graph below indicate the settlement that scores best for accessibility, for all modes combined, at the top of the table, and the shortest column on the graph. This could be considered an indicator of relative "all modes" accessibility of the settlements.

Rank	Settlement	Score for all modes (by combining rankings)
1	Istead Rise	14
2	Meopham Green	17
3	Higham	18
4	Hook Green	20
5	Lower Shorne	26
6	Shorne Ridgeway	27
7	Shorne	29
8	Three Crutches	32
9	Culverstone Green	34
10	Sole Street	35
11	Cobham	36
12	Vigo	39
13	Lower Higham	46
14	Longfield Hill	50
15	Luddesdown	57
16	Harvel	64



7.10.4 The above table and graph have been repeated by combining only walking, cycling, bus and rail as shown below. This could be considered an indicator of relative "sustainable modes" accessibility of the settlements.

Rank	Settlement	Score for walk, cycle, bus and rail (by combining rankings)
1	Hook Green	8
2	Meopham Green	8
3	Higham	12
4	Istead Rise	12
5	Lower Shorne	21
6	Culverstone Green	24
7	Shorne Ridgeway	24
8	Shorne	25
9	Vigo	26
10	Sole Street	27
11	Cobham	29
12	Lower Higham	31
13	Three Crutches	31
14	Longfield Hill	39
15	Luddesdown	43
16	Harvel	48



8 Summary

8.1.1 Gravesham Borough Council have appointed Stantec to produce a strategic level transport evidence base to support the Regulation 18 stage of the Local Plan Core Strategy review. The study completed has sought and incorporated the views of the highway authorities of Kent County Council and Highways England.

8.1.2 This document is Part 1 of 2 and considers the existing and baseline situation within the Borough. This report is provided to a level of detail consistent with the needs of a Regulation 18 submission and to predominantly assist GBC in defining areas of search and potential transport issues. Further detailed transport modelling will be undertaken as options are refined to support consultation on the Regulation 19 submission version of the Local Plan prior to independent examination.

8.1.3 The evidence base developed enables GBC to compare different Local Plan options and hence facilitate their decision in identifying a preferred strategy for development in the Borough.

8.1.4 The NPPF states that transport issues should be considered at the start of plan making and development proposals. This approach will allow the impact of development on transport networks and the opportunities to use and enhance sustainable transport networks to be considered early on whilst recognising that opportunities to maximise sustainable transport solutions will vary between urban and rural areas.

8.1.5 A number of settlements and centres have been considered within this study and these have been based upon the GBC paper “Gravesham Settlement Hierarchy Technical Paper 2017”. The 2017 paper recognises that the existing urban area of Gravesend / Northfleet, which in part includes the emerging development at Ebbsfleet, are likely to be the areas capable of accommodating the most sustainable development in the borough.

8.1.6 Nevertheless, there is a need to review the potential for development in the other identified settlements and hence these have been considered in further detail within the context of this study.

8.1.7 For the purpose of this study the baseline has been taken as the outputs from the LTAM model as supplied by Highways England. For the sake of simplicity, the LTAM data has been used as the baseline against which to compare the various local plan scenarios to be assessed. This effectively means that different quanta and distribution of development have been subject to initial evaluation over and above what is assumed in the LTAM model

8.1.8 Traffic flow data has been gathered from various sources. This data has been used to compare against the 2016 base year LTAM model for the Gravesham area to review the goodness of fit of the model to observed data. The comparison of traffic flows has been completed in the context of the LTAM being used by GBC for a strategic development control exercise, rather than a specific scheme appraisal.

8.1.9 Whilst the LTAM model would not meet the usual DMRB criteria for a detailed scheme appraisal model, it is currently the most appropriate tool for providing forecast year traffic flows within north Kent, particularly in the context of providing traffic flows for a Lower Thames Crossing scenario. Importantly, the objective for using the LTAM model flows in this appointment is not necessarily to achieve a model match with observed traffic flows that would be required for detailed scheme appraisal, but to be an informative when considering the relative merits of strategic Local Plan scenarios and options.

8.1.10 A set of 2019 base year flows has been derived from the 2016 LTAM output through interpolation of the 2016 and 2026 data provided. A 2028 forecast year has been considered

to reflect the end of the existing Local Plan. A 2036 forecast year has been considered to reflect the end of the emerging Local Plan.

8.1.11 Forecast baseline LTAM model data for 2028 and 2036 has been derived by interpolating the 2026 and 2041 LTAM output Shape files provided by GBC and HE. This has been completed for the with and without Lower Thames Crossing scenarios.

8.1.12 The forecast baseline traffic flows have been compared to the 2019 base year traffic flows within a spreadsheet model and GIS software. This exercise allows identification of areas of the network that are predicted to increase over time regardless of the new Local Plan proposals.

8.1.13 Differences have also been reviewed for the two baseline years (2028 and 2036) for the with and without Lower Thames Crossing scenarios.

8.1.14 KCC have provided 3 years of crash data for the Gravesham borough area. This data has been input to GIS software and plotted by year and by severity of crash.

8.1.15 A baseline overview of the transport network serving Gravesham was completed for the individual settlements considered within this study.

8.1.16 An exercise has been completed that reviews the existing 2011 census data evidence base with respect to car ownership. This has been completed at a Lower Super Output Area level.

8.1.17 In general terms car ownership within Gravesham tends to be higher than the average to the south of the A2 corridor, within the rural areas. To the north of the A2 the car ownership levels are typically lower than average within the town centre and immediate surrounds.

8.1.18 A review of the 2011 census journey to work data has been undertaken to provide an understanding of the movement of people between the various MSOAs within Gravesham and externally. This provides a high level summary of where people who live within Gravesham travel to for work purposes.

8.1.19 The majority of trips generated by Gravesham MSOAs travel to areas external to Gravesham borough. This comprises 65% of trips from urban areas and 74% of trips from rural areas.

8.1.20 Around a third of Gravesham residents also travel to work within the borough. More than a third of Gravesham residents who also work within the borough do so within the town centre whilst less than 10% work within the rural areas south of the A2.

8.1.21 More than a quarter of Gravesham residents who work external to the borough do so within Dartford borough. Around a third travel to central London and the south east London boroughs and around a third travel to the immediate neighbouring Kent districts.

8.1.22 A high level review of the mode share patterns has been completed based upon the census journey to work data. This has also considered urban MSOAs and rural MSOAs separately. Car and van driver mode accounts for the majority of trips. It is further noted that whilst the train mode share percentage is similar for urban and rural areas, the bus, cycle and walk mode shares are significantly greater for urban areas when compared to rural.

8.1.23 The high level relative accessibility of each of the identified settlements within this study has been considered. A relative comparison of each settlement has been made for each mode of travel based upon a set of weighting and scoring criteria.